Extron Electronics

INTERFACING, SWITCHING AND DISTRIBUTION

User's Manual

Matrix 100 Switcher

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68-199-01, Rev B
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The following icons may be used in this manual:

_____ *Important information — for example, an action or a step that must be done before proceeding.*

_____ *A Warning — possible dangerous voltage present.*

_____ *A Warning — possible damage could occur.*

_____ *A Note, a Hint, or a Tip that may be helpful.*

_____ *Possible Electrostatic Discharge (ESD) damage could result from touching electronic components.*

_____ *Indicates word definitions. Additional information may be referenced in another section, or in another document.*

Matrix 100
User's Manual

Chapter One
Introduction to Matrix 100

I/O Modules

Configurations

Standard Features

Optional Features

Matrix 100 Module Specifications

General

Each Extron Matrix 100 is custom designed to the user's specifications. The configuration is built from various combinations of ten I/O modules. The I/O modules and possible configurations are listed below. The Matrix 100 can be controlled from a host computer or from a QuickSwitch Front Panel Controller (QS-FPC).

Matrix units can also be interconnected to expand the switching capabilities for up to 48 inputs by 48 outputs. This allows for multiple switching combinations.

I/O Modules

Matrix 100 Switchers are ordered for a specific application with a combination of I/O modules. Each module switches one type of video signal – one for red, one for blue, etc. One audio module switches both left and right stereo channels.

- *4 x 4 Medium-Resolution Analog Module (MRAM), 175 MHz video bandwidth*
- *8 x 4 Medium-Resolution Analog Module (MRAM), 175 MHz video bandwidth*
- *8 x 8 Medium-Resolution Analog Module (MRAM), 175 MHz video bandwidth*
- *4 x 4 Sync Module*
- *8 x 4 Sync Module*
- *8 x 8 Sync Module*
- *4 x 4 Video Module*
- *8 x 4 Video Module*
- *8 x 8 Video Module*
- *8 x 8 Stereo Audio Module*

For example: a Matrix 100 designed to switch RGB, separate horizontal and vertical sync, and stereo audio will require the following modules: three MRAM, two Sync and one audio modules.

Configurations

Depending upon the configuration of I/O modules (above), the Matrix 100 Switcher can have up to 16 different input/output configurations. The configuration determines how many modules are required.

- *RGsB – Red, Green, (sync on green), Blue*
- *RGBS – Red, Green, Blue and separate composite Sync*
- *RGBHV – Red, Green, Blue and separate H&V Sync*
- *RGsBCv – Red, Green, (sync on green), Blue, and Composite video*
- *RGsBYC – Red, Green, (sync on green), Blue and S-Video*
- *RGBSCv – Red, Green, Blue, composite Sync, and Composite video*
- *RGsBA – Red, Green, (sync on green), Blue, and Audio*
- *RGBSA – Red, Green, Blue, Sync, and Audio*
- *RGBHVA – Red, Green, Blue, separate H&V sync, and Audio*
- *RGsBCvA – Red, Green, (sync on green), Blue, Composite video, and Audio*
- *RGsBYCA – Red, Green, (sync on green), Blue, S-Video, & stereo Audio*
- *RGBSCvA – Red, Green, Blue, composite Sync, Composite video, and Audio*
- *CvA – Composite video, and Audio*
- *YCA – S-Video with Audio*
- *Cv – Composite video*
- *YC – S-Video*

Standard Features

- *Microprocessor control, with battery backup*
- *RS-232 control*
- *RGBS, Video, Audio Breakaway*
- *Composite and S-Video Genlock*
- *RGB video delay switching (via RS-232/RS-422)*
- *175 MHz bandwidth.*

Microprocessor Control The Matrix 100 is programmable from a host system, or from the optional QuickSwitch Front Panel Controller. It uses memory to store up to eight preset configurations. The battery backup prevents loss of preset information.

RS-232 Control The Matrix 100 can be controlled by any remote control system or computer with serial communications capability. Refer to Appendix A for programming guidelines including a complete listing of RS-232 commands and protocol.

Breakaway The RGBS, Video, Audio Breakaway feature of the Matrix 100 allows the user to program any Video, S-Video or Audio Channel to be controlled separately (breakaway), or as a group (follow one or more inputs, or all RGB inputs). A fully populated RGBS composite video and audio switcher can be controlled as three separate switchers.

Breakaway provides individual video or audio outputs to follow any one or more RGBS inputs when switched to an output channel. This makes the Matrix 100 capable of adding audio to any or all RGBS or video channels, as well as switchable video and audio to follow any switched RGBS channel.

Video Genlock The Matrix 100 features a broadcast quality NTSC/PAL/SECAM Composite Video or S-Video Genlock for synchronized switching of signals. The Matrix 100 will Genlock as many composite video signals as are installed in the switcher.

RGB Delay Switching The Matrix 100 can be programmed (via RS-232) to delay switching the RGB video for 1 to 9 seconds after the sync is switched. This allows the display device to be in sync before the picture arrives, providing seamless switching of the RGBS signals when switching between various frequencies.

175 MHz Bandwidth Even when fully populated, the Matrix 100 has a bandwidth of no less than 175 MHz (-3 dB).

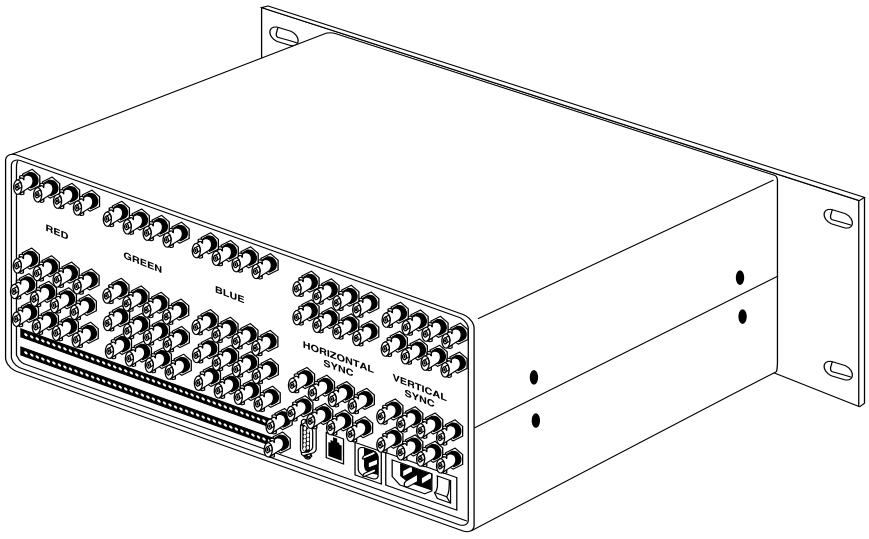


Figure 1-1. Rear view of a fully-populated Matrix 100 Switcher

Optional Features

- *QuickSwitch™ Front Panel Controller (QS-FPC)*
- *Redundant power supply*
- *SmartControl™ microprocessor*

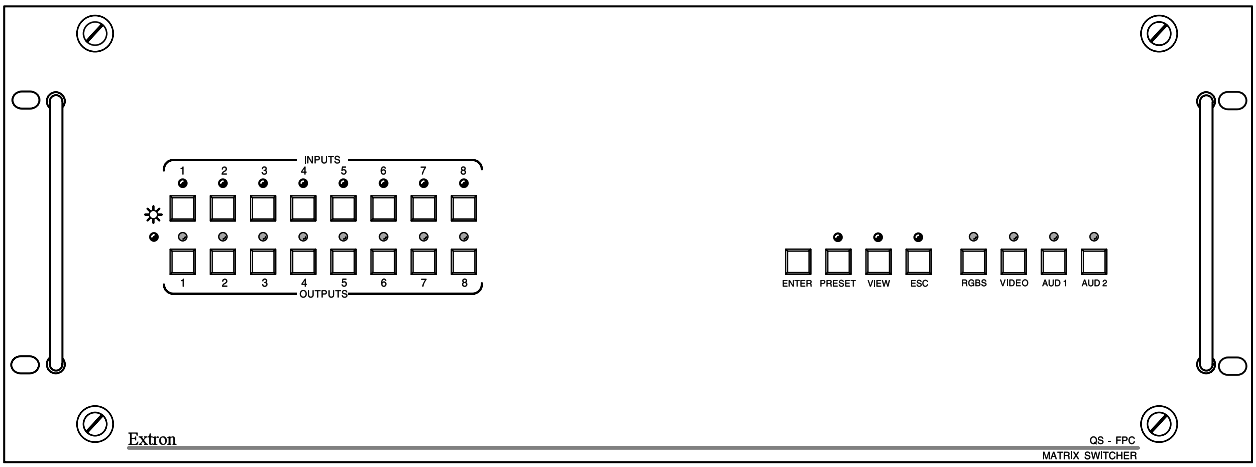


Figure 1-2. Matrix 100 Front panel

QuickSwitch™ Front Panel Controller (QS-FPC)

The QuickSwitch Front Panel Controller (QS-FPC) provides local control of all Matrix 100 Switcher functions. It is supplied as an optional accessory to the Matrix 100 and is intended for users who wish to supplement normal RS-232 computer control with local or remote operator control. Refer to Chapter 2 for instructions for mounting the QS-FPC, and to Chapter 4 for operation. The QS-FPC includes the following features:

Control Microprocessor SmartControl™ is the Front Panel's built-in microprocessor. With it, the user determines the Matrix 100 input/output configuration, what presets are saved, as well as all other switcher settings.

Configuration Memory SmartControl can store up to eight different matrix configurations (called presets). This can save hours of reprogramming each I/O configuration. The QuickSwitch Front Panel Controller (QS-FPC) allows for easy configuration of inputs and outputs, as well as the control of additional system features.

QuickSwitch SmartControl The Front Panel includes full complement of function buttons make setup and programming the unit fast and easy.

Redundant Power Supply

The Matrix 100 can be ordered with an optional redundant (backup) power supply to prevent signal loss if input power to the primary power supply should suddenly be lost or interrupted.

Sample Configuration

Figure 1-3 shows one example of the I/O modules that could be installed in six planes of a Matrix 100. See page 1-1 for I/O modules and possible configurations.

For example, an 8 x 8 RGBS switcher requires: three 8 x 8 medium-resolution analog modules (MRAM) and one 8 x 8 sync module (Syn). This would occupy the Red, Green, Blue and one Sync/Video planes. The fifth plane could have a composite video module (Cv), and the sixth plane could have an audio switching module (Aud).

This configuration is capable of being controlled and routed as three separate switchers:

- *one 8 x 8 RGBS matrix switcher*
- *one 8 x 8 video switcher*
- *one 8 x 8 audio switcher*

In addition, SmartControl™ allows the Matrix 100 to group these functions as a single RGBS composite video switcher with stereo audio.

The bottom of the diagram illustrates how the Main Controller (and the optional QuickSwitch Front Panel Controller) routes the various inputs to the outputs.

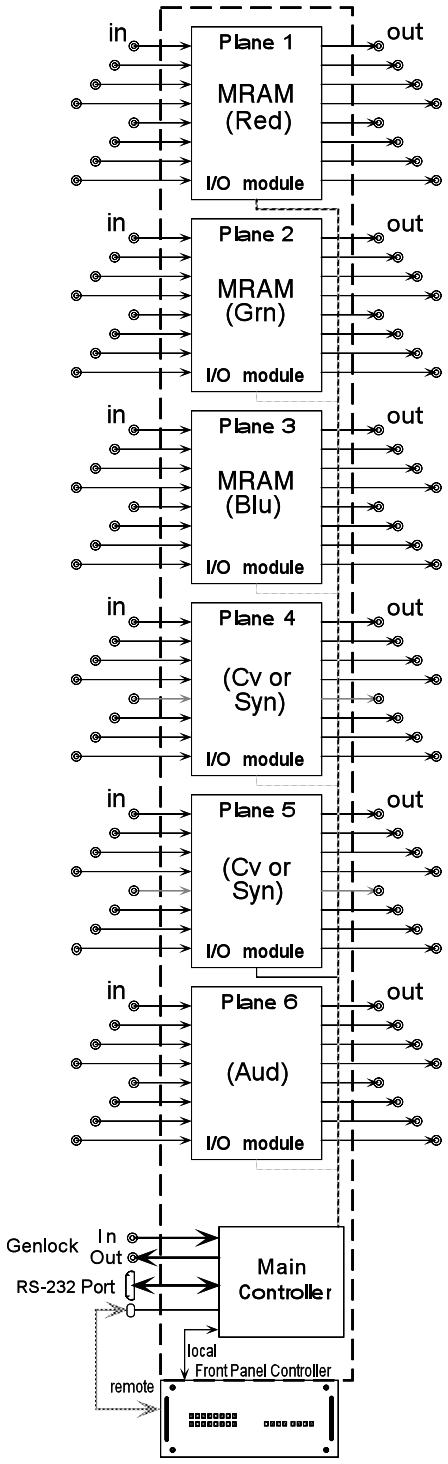


Figure 1-3. Block diagram of a Matrix 100

Matrix 100 I/O Module Specifications

Power	90 - 260 VAC, 50/60 Hz, 60 Watts
Dimensions	17" W, 15" D, 6.8" H
Shipping Weight	22 lbs (10 kg)
Operating Temperature	0° C - 50° C
Storage Temperature	-20°C - 70° C
MTBF	35,000 Hours (demonstrated)
Approved	UL Listed
Warranty	2 years parts and labor

MRAM Video (Medium Resolution Analog Module)

Connectors	BNC
Bandwidth	175 MHz (-3 dB)
Crosstalk:	
at 10 MHz	-50 dB(typical) See note 1.
at 100 MHz	-30 dB
Isolation:	
at 10 MHz	-60 dB (typical) See note 2.
at 100 MHz	-55dB
Return Loss:	
at 10 MHz	-20 dB
Input Impedance	75 ohms
Output Impedance	75 ohms
Switching Speed	200 ns (nominal)
Input Signal	0.3-1.0 V p-p (max dc offset ± 0.30 V)
Gain	Unity ±1%

Note 1: Crosstalk is the attenuation of all hostile signals relative to a given input-output connection.

Note 2: Isolation is the attenuation of an input signal relative to an un-selected output when all inputs have the same signal applied simultaneously.

Composite Video Module

Frequency Response	-0.5 dB @ 5 MHz; -3.0 dB @ 15 MHz
Differential Gain	0.5%
Differential Phase	1.3°
Line and Field Tilt	Less than 0.1%
Isolation between outputs	Greater than 40 dB @ 5 MHz
Crosstalk	Greater than 40 dB @ 5 MHz
CMRR	-60 dB
Propagation Delay	10ns
Input Signal	75 ohms, analog, 0-1.0 V p-p (max dc offset ±0.30 V)
Gain	Unity

Sync Module

Input Impedance	510 ohms
Output Impedance	75 ohms
Max. Input Voltage	±5 V
Input Sensitivity	500 mV p-p
Output Level	4.5 V p-p not terminated; 2.2 V p-p terminated at 75 ohms
Max. Propagation Delay	64ns H to L (41 ns L to H)
Max. Rise/Fall Time	8 ns H to L (3.6 ns H to L)
Polarity	Follows input

Audio Module, General

Input Impedance	High Z (>10k ý, typical)
Input Voltage Level	To 6 V p-p into 600 ý
Output Impedance	Low, capable of driving 600 ý, balanced
Output Level	Unity gain
Connectors	6-conductor, Captive Screw Audio Terminal
Signal to noise	Better than 110 dB, 20Hz-20kHz
Total Harmonic Distortion + Noise	
Worst case	0.03% @ 20kHz, 30 V p-p (Differential Output)
Adjacent Channel Crosstalk	Better than -85 dB @ 20kHz
Common Mode Rejection Ratio	-55 dB worst case @ 20kHz (-65 dB Typical)
Stereo Channel Separation	Greater than 60 dB 20 Hz - 20kHz
Bandwidth	20Hz - 20kHz, Flat ± 0.1 dB

Audio Input Specifications

Maximum Input Level	45 V p-p Differential 22 V p-p Single-ended
Nominal Input Program Level:	-10 dBu (300 mV rms)
Input Impedance	20 k ý, Differential 10k ý, Single-ended

Audio Output Specifications

Maximum Output Level:	45V p-p Differential 22 V p-p Single-ended
Nominal Output Program Level:	
Professional Mode	+4 dBu (1.2 V rms)
Consumer Mode	-10 dBu (300 mV rms)
Output Impedance	50 ý, Differential to Ground

Notes:

Chapter Two

Rear Panel Connections

Multiple Output Connections

Genlock Connections

RGB Input Connections

Composite Video Input Connections

S-Video Input Connections

Audio Terminal Connections

Multi-Output Connection

When using the Matrix 100 to switch different types of video signals, the signal output from the switcher is in the same format as the input.

- *RGB and Sync (composite or separate H&V) signals will pass through the RGB and Sync outputs*
- *NTSC and PAL video signals will pass through the composite video output*
- *S-Video will pass through the S-Video output (two Video modules)*

Therefore, if multiple signal types are used in the same switcher, those same signals will be available to the output devices.

In the diagram below, the Matrix 100 supplies RGB output for large screen projectors and data monitors, composite video output for LCD projector and audio output for a stereo audio system.

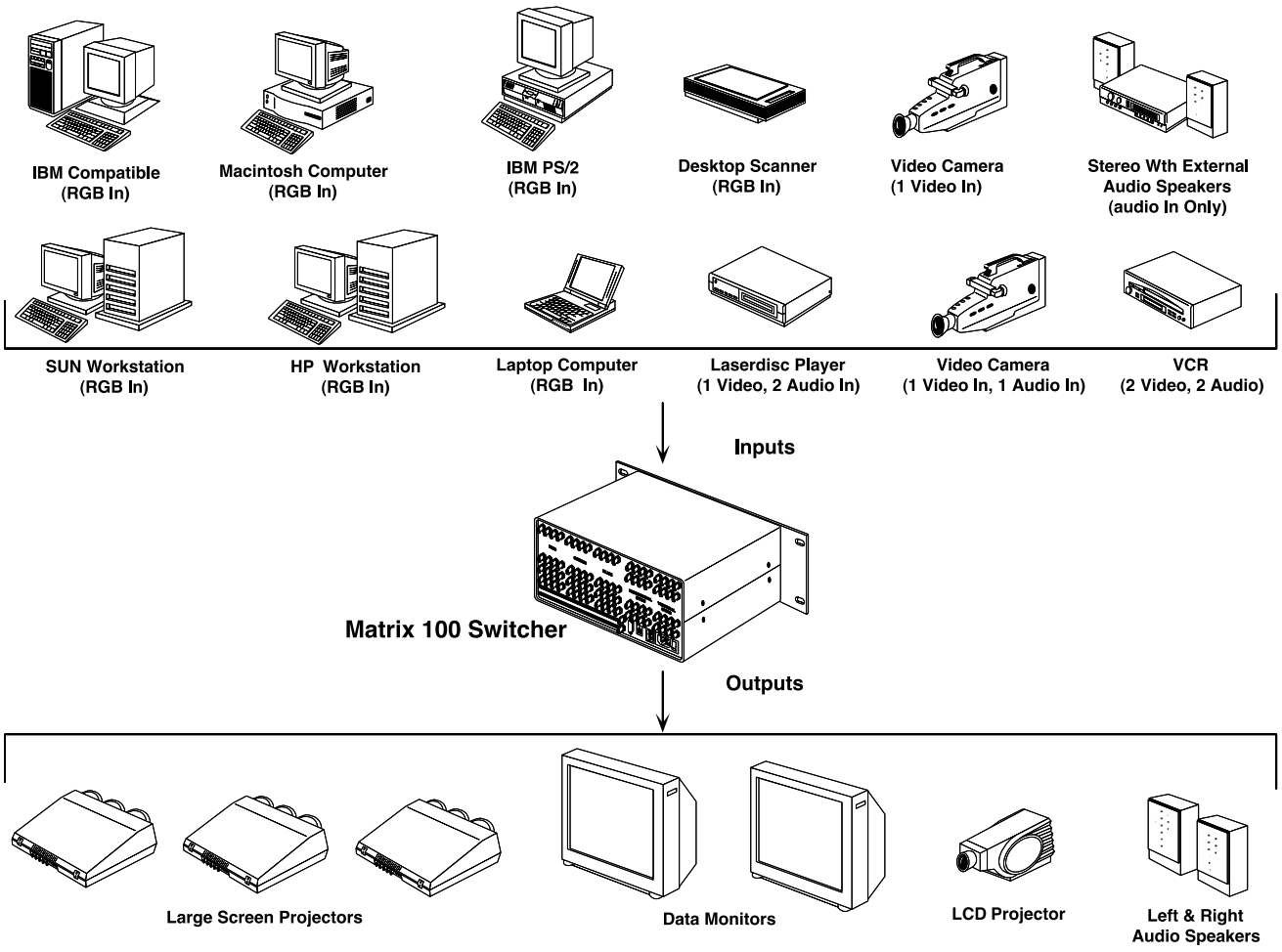

IBM Compatible (RGB In)
Macintosh Computer (RGB In)
IBM PS/2 (RGB In)
Desktop Scanner (RGB In)
Video Camera (1 Video In)
Stereo Wth External Audio Speakers (audio In Only)
SUN Workstation (RGB In)
HP Workstation (RGB In)
Laptop Computer (RGB In)
Laserdisc Player (1 Video, 2 Audio In)
Video Camera (1 Video In, 1 Audio In)
VCR (2 Video, 2 Audio)
Inputs
Matrix 100 Switcher
Outputs
Large Screen Projectors
Data Monitors
LCD Projector
Left & Right Audio Speakers

Figure 2-1. Matrix 100 Switcher and Input/Output Devices

Genlock Connections

If so desired, the Matrix 100 can use an external Genlock signal to synchronize composite video or S-Video switching.

The illustration here shows the Genlock connections. The In connector goes to a timing source. The Out connector allows the signal to be passed on to another video device; it does not have to be connected for Matrix operation.

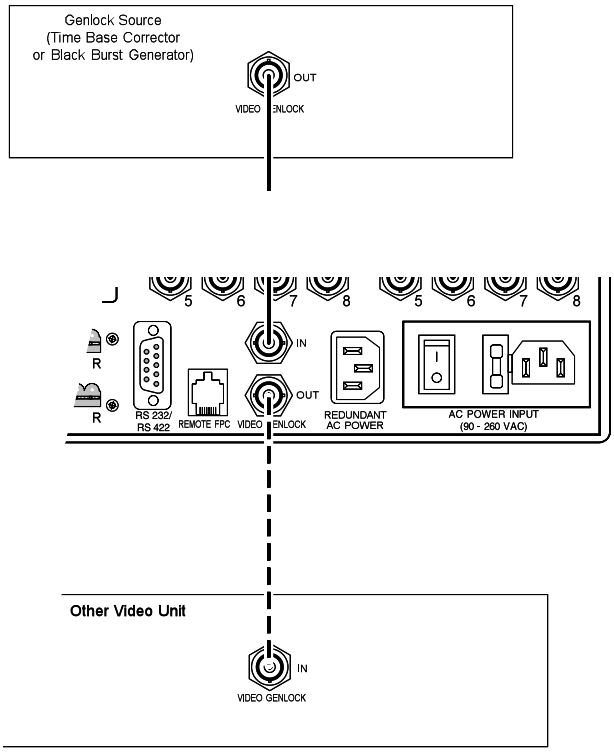


Figure 2-2. Genlock connects to a timing source.

RGB Input Connections

All RGB input and output connections to the Matrix 100 are made with BNC type connectors. Many types of RGB output devices (scan doublers, document cameras, etc.), including most computers, do not have BNC video output connectors. If not, a suitable adapter, or an Extron computer-video interface, should be used to adapt the device output to the BNC input of the Matrix 100. With the proper adapter, the RGB and Sync signals can be connected directly to the R, G, B, H, V inputs of the switcher. If the RGB signal is using the Sync-on-Green channel, connect the RGB cables to the switcher without using the sync channels.

RGB input connections to the Matrix 100 can be made using the following combinations:

Without Audio

RGsB - Red, Sync-on-Green, Blue

RGBS - Red, Green, Blue, and Composite Sync

RGBHV - Red, Green, Blue, H&V Sync

With Audio

RGsB with R&L Audio - Red, Green, Blue, and Audio Follow

RGBS with R&L Audio - Red, Green, Blue, Sync and Audio Follow

RGBHV with R&L Audio - Red, Green, Blue, H&V Sync and Audio Follow

The following pages illustrate examples for the above combinations with Right and Left Audio connections. If audio is not being used, ignore that part.

RGB Connections, with Right & Left Audio

Figure 2-3 illustrates the Matrix 100 connections for switching RGB, or component video. Choose an input number and connect each cable from the source to the appropriate input on the Matrix 100. (The example shows Input #1.) Likewise, choose an output number and connect each of the three cables to a destination device.

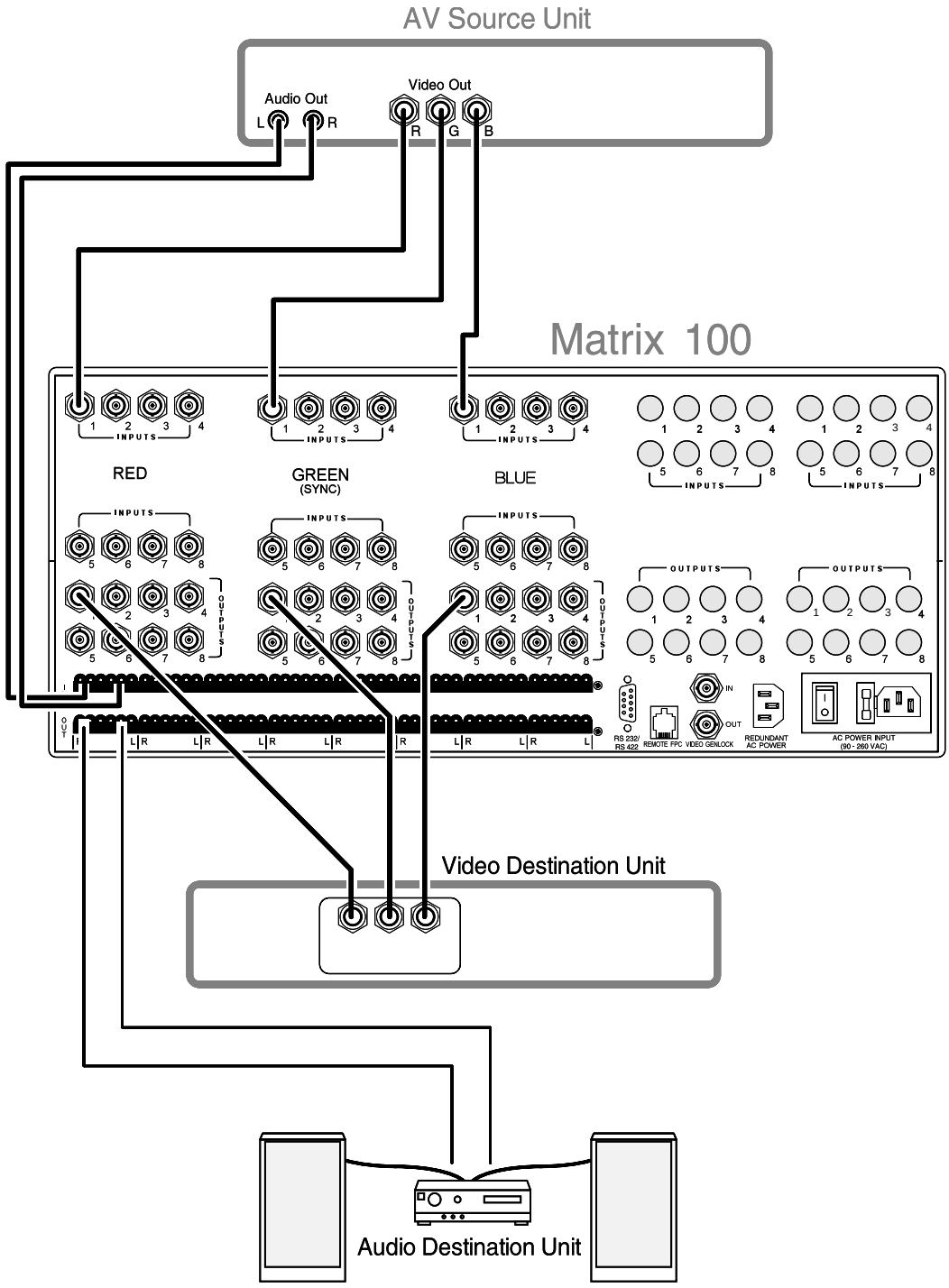


Figure 2-3. An example of RGB, or Component Video

Audio Connections may or may not be used. See page 2-9 for wiring.

RGBS Connections with Right & Left Audio

Figure 2-4 illustrates the Matrix 100 connections for switching RGBS, or video with composite sync. Choose an input number and connect each of the four cables from the source to the appropriate input on the Matrix 100. (The example shows Input #2.) Likewise, choose an output number and connect each of the four cables to a destination device.

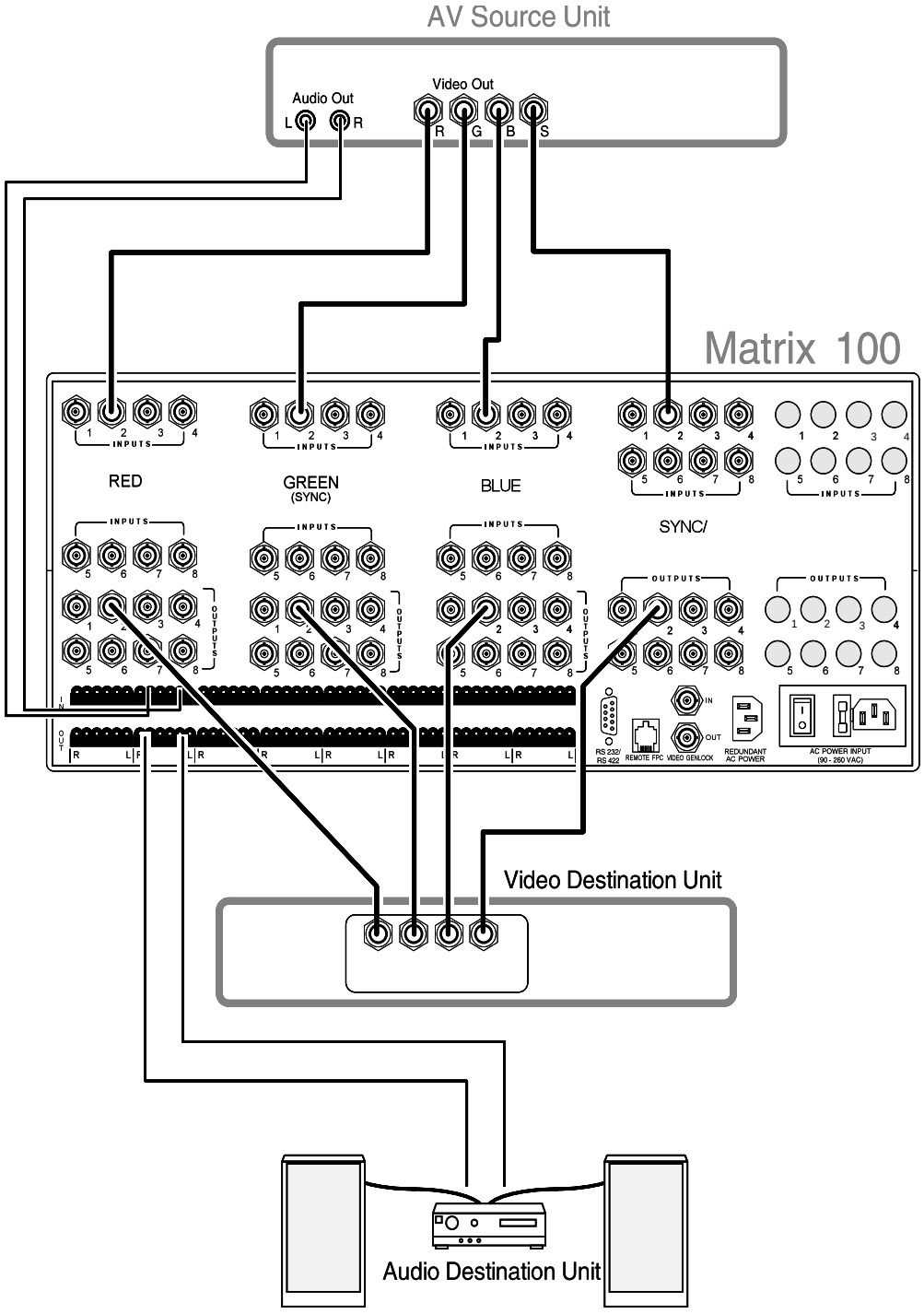


Figure 2-4. An example of RGBS, 4-BNC, or Composite Sync Video

Audio Connections may or may not be used. See page 2-9 for wiring.

RGBHV Connections with Right & Left Audio

Figure 2-5 illustrates the Matrix 100 connections for switching RGBHV, or video with separate sync. Choose an input number and connect each of the five cables from the source to the appropriate input on the Matrix 100. (This example shows Input #2.) Likewise, choose an output number and connect each of the five cables to a destination device.

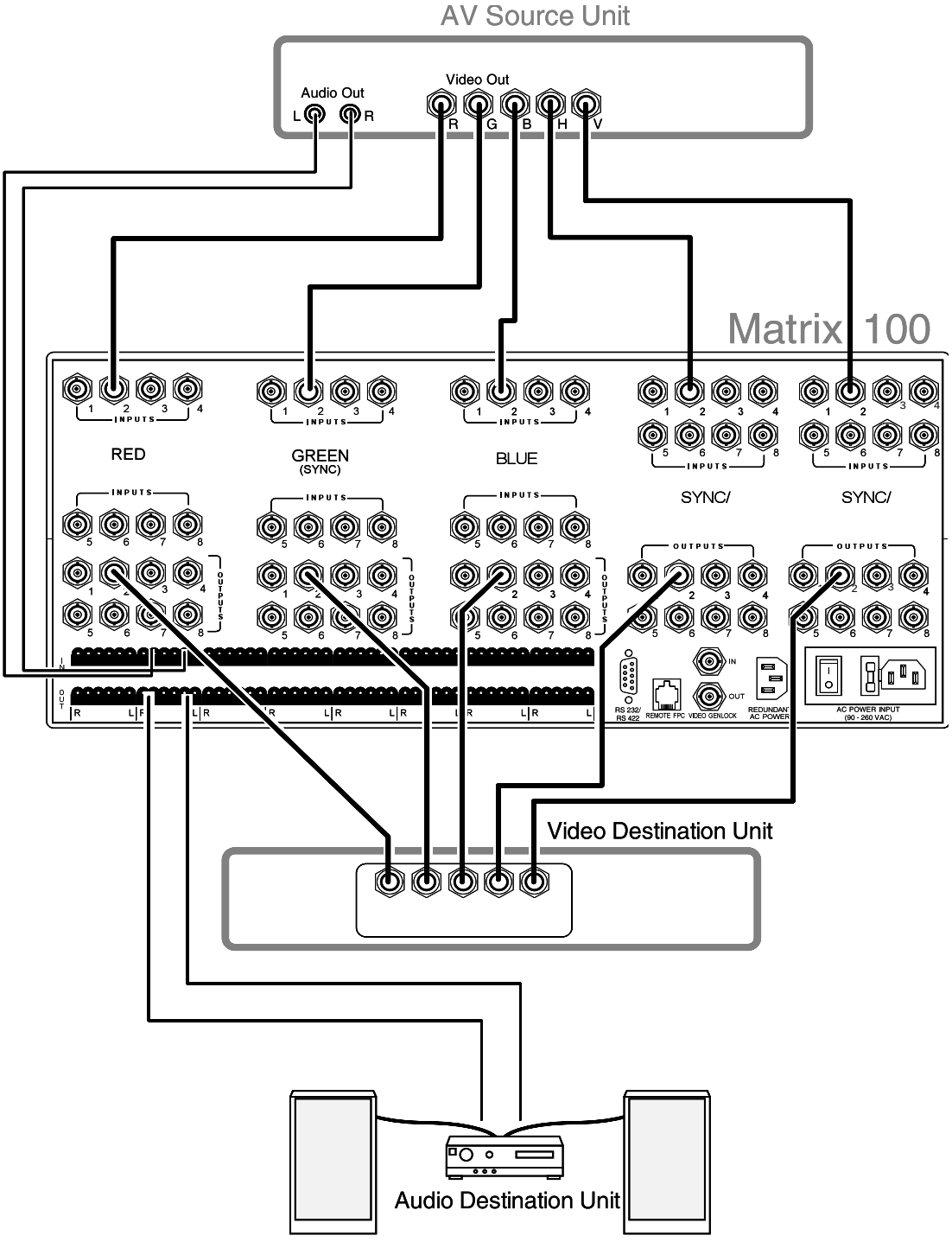


Figure 2-5. An example of RGBHV, 5-BNC, or Video with Separate (H and V) Sync

Audio Connections may or may not be used. See page 2-9 for wiring.

Composite Video Connections

NTSC and PAL are television or VCR type signals on a single coax cable, which may or may not have stereo audio. For this application, the Matrix 100 uses one Composite Video module, shown in Figure 2-6 in the right-most position.

Connect the output of an NTSC/PAL video source to a Video module input. (See illustration below.) Connect the video output from the Matrix to a destination device that uses Composite Video.

NTSC - National Television Standards Committee
PAL - Phase Alternation Line

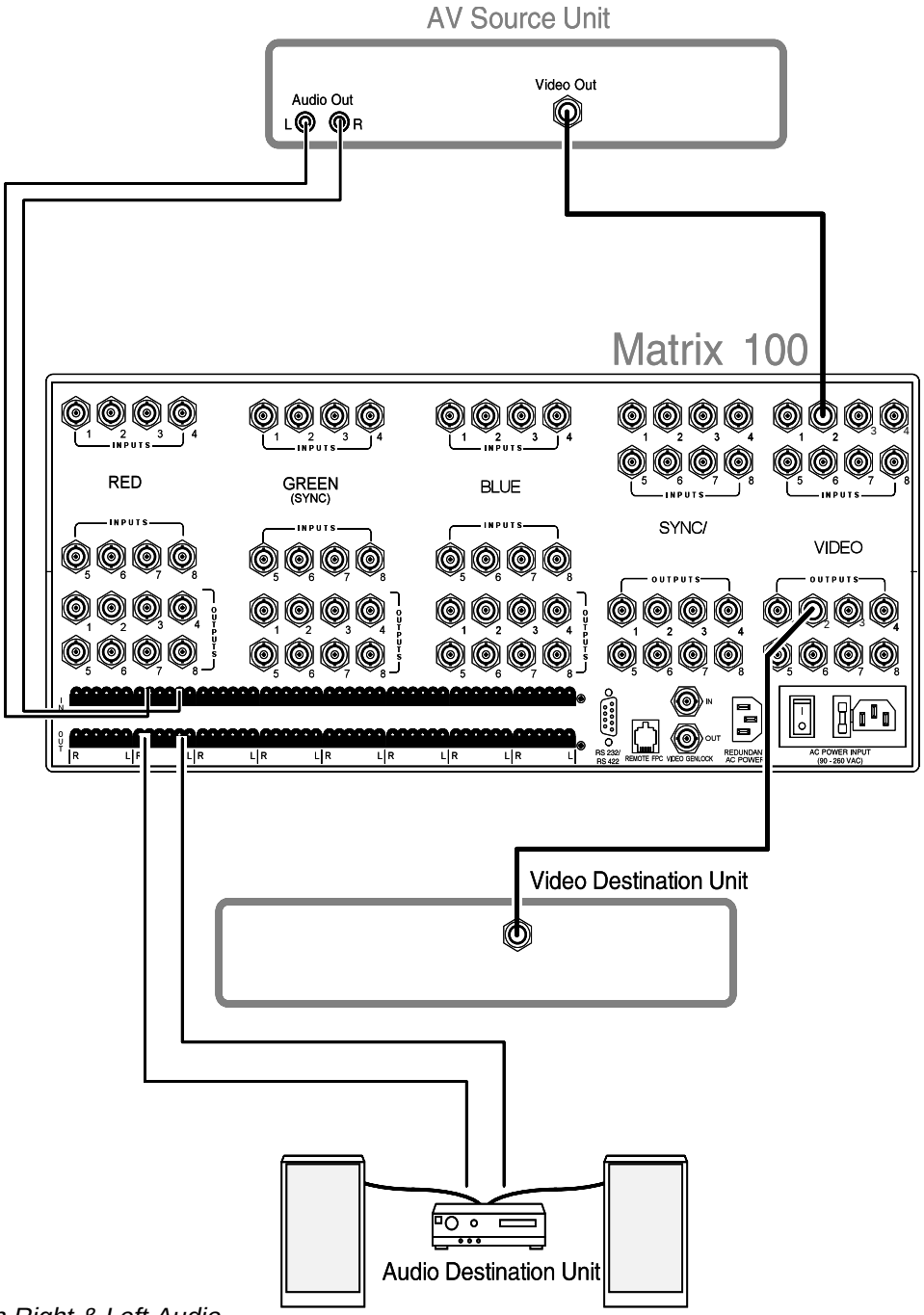


Figure 2-6. Composite Video with Right & Left Audio

Audio Connections may or may not be used. See page 2-9 for wiring.

S-Video Connections

S-Video (S-VHS) is typically the output from the AV source on a 4-pin miniature din-type connector and must be converted to 2 BNC type connectors - one for Chrominance (C) and the other for Luminance (Y).

To adapt S-VHS to BNC, use Extron cable 26-353-01.

To connect S-Video to the Matrix 100, the Matrix must be ordered with **two** composite video modules. Use one for Luminance (Y) and the other for Chrominance (C). The Y and C signal lines are then connected to the two video modules. See illustration on facing page.

When connecting Y and C cables, be sure to use the same input numbers on the two video modules for each source. This example uses number 2 inputs. Also use the same output number pair for each destination. This example uses number 2 outputs, but we could have used outputs number 1, or 3, etc.

Input Connections

Choose which input number to use to connect the S-Video source device to the Matrix 100. Connect the Luminance (Y) to the input connector on the first (left) Video module and the Chrominance (C) to the same input number on the second (right) Video module.

If audio is used, connect the right and left audio source outputs to the right and left inputs on the back of the Matrix 100. See page 2-9 for details on audio connections.

Output Connections

Choose which Matrix 100 output number to use for the S-Video destination unit. Connect the Luminance (Y) output from the first (left) Video module to the Luminance input of the destination unit. Connect the Chrominance (C) from the same output number on the second (right) Video module to the Chrominance input of the Video destination unit.

If audio is used, connect the right and left audio output from the Matrix connector to the right and left inputs of the audio destination unit. See page 2-9 for details on audio connections.

A Matrix 100 can be configured with RGsB (sync on green) and S-Video.

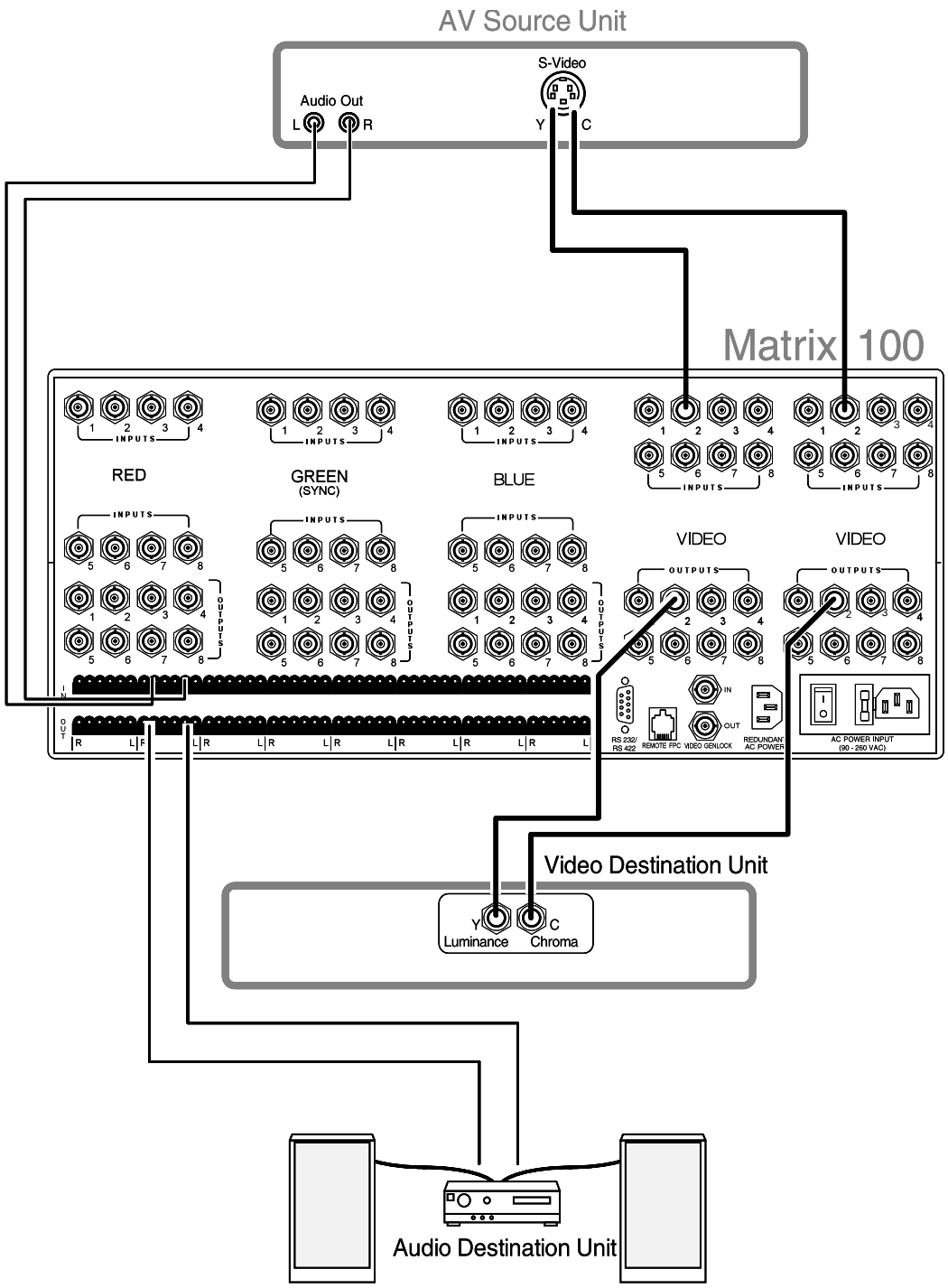
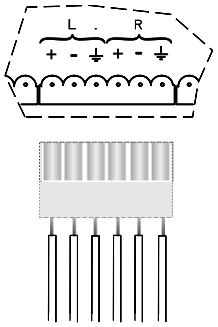


Figure 2-7. S-Video Connections with Right & Left Audio

Audio Connections may or may not be used. See page 2-9 for wiring.

Audio Terminal Connections



The rear of the Matrix 100 has two rows (16 sets) of audio connector pins, below the BNC connectors. The top row is for 8 inputs, and the bottom for 8 outputs. Each group of six pins accommodates a left and a right audio channel. One sample is shown here.

The 6-terminal audio connectors are supplied with the switcher. The connectors are wired to the audio cables, using the captive screws inside the connectors. The connectors are then plugged into the appropriate position in the audio terminal strip on the rear panel. The audio area of the back panel is labeled "R" (right) and "L" (left) for each channel.

When wiring the connectors and inserting them into the Matrix 100 switcher, the screw heads (see illustration right) must face **down**.

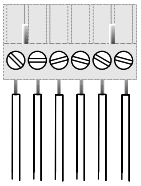
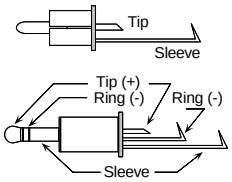


Figure 2-8. Audio Connectors with Captive Screws (above and right)

Audio Wiring Applications



Three methods of wiring the connectors for input and output are listed here, and illustrated below. The connector screws do not show in the picture because they are on the other side.

- *Unbalanced High Impedance (High Z) Stereo Tip, Ring, Ground (Left & Right)*
- *Balanced High Impedance (High Z) Stereo Tip, Ring (Left & Right)*
- *Balanced 600 ý input Impedance Stereo Tip, Ring (Left & Right)*

Figure 2-9. Typical Audio Cable Connectors

If using unbalanced audio output, use lower-left connector as an example, and connect the sleeve to Gnd. Connecting it to the negative (-) terminal will damage audio output circuits.

Use captive-screw audio connectors, Extron part number 10-163-01

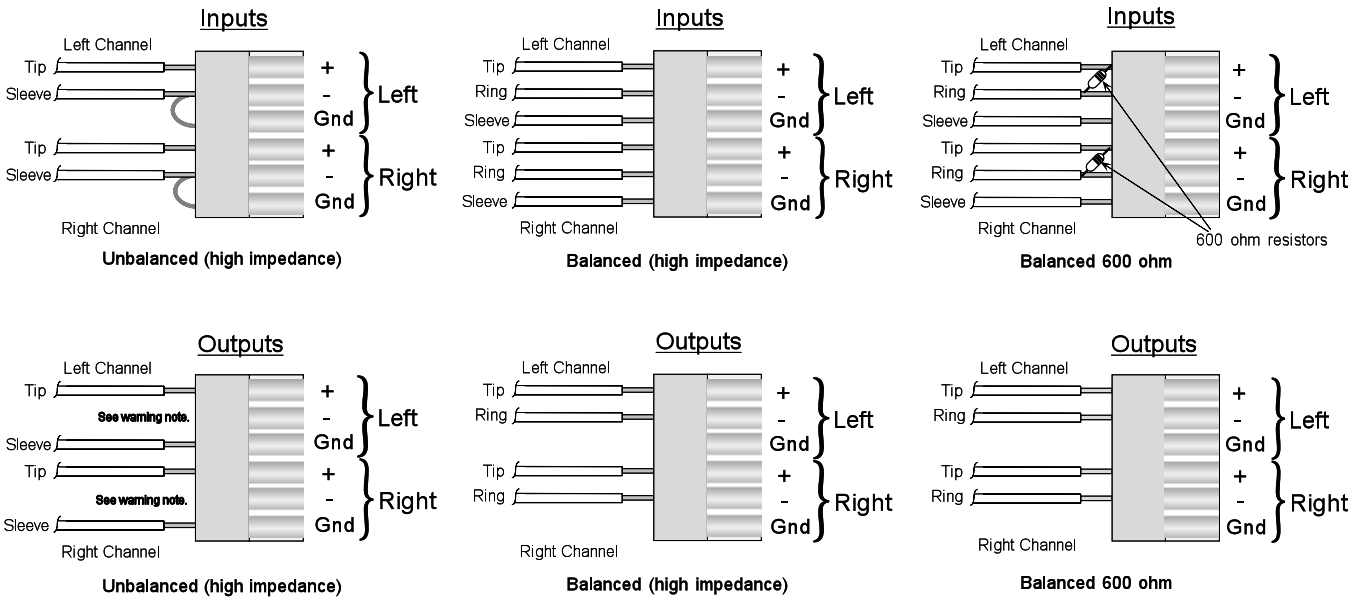


Figure 2-10. Three ways to wire the Input and Output Audio Connectors

3

Chapter Three

Using the Front Panel Controller

I/O Module Select

Input and Output Buttons

Control Buttons

Operating Examples

Configuration Worksheets

QuickSwitch™ Front Panel Controller (QS-FPC) Operation

The QuickSwitch Front Panel Controller (Figure 3-1) has its controls arranged in two areas. The left side is Input and Output buttons, and the right side is Control buttons and I/O Module Select buttons.

The basic operation of this panel is that it allows the user to tie any one input to one or more outputs. (An output can never be tied to more than one input.) Thus, each input may have a tie (one output), or a “set of ties” (more than one output). At any one time, the active configuration of a Matrix 100 may have a set of ties per each available input. Any configuration (sets of ties) may be stored as a Preset. The maximum number of Presets is eight. The Matrix 100 has Battery Backup; Presets remain saved when power is off.

Because each Matrix 100 is custom-built, it may have different combinations of Input/Output (I/O) modules. For this reason, the operation of your unit will vary to reflect these differences. See page A-3 for information on how each unit is built. The QS-FPC (Front Panel) is also an option.

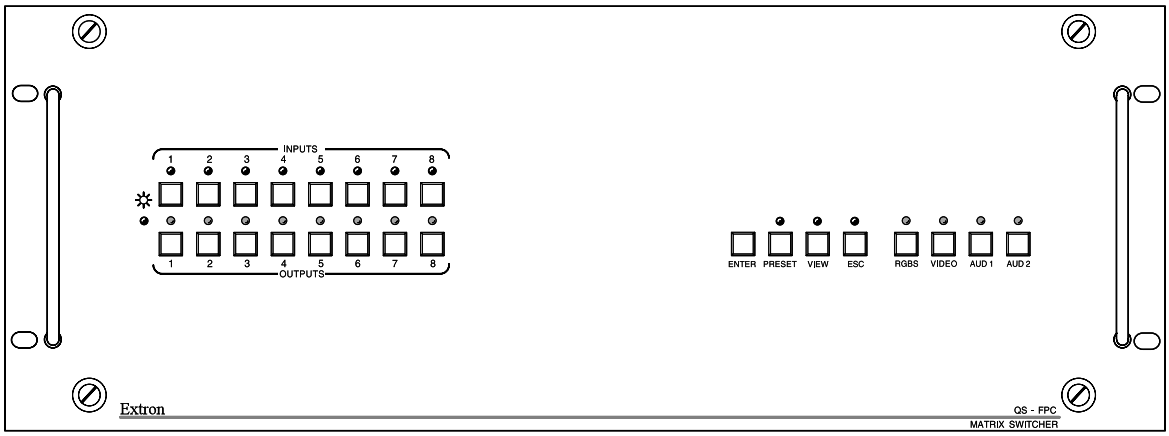


Figure 3-1. Matrix 100 Front Panel

Power On Switch and LED

Before using the Matrix 100 front panel, turn power on with the Power Switch on the back of the unit (shown right). The red LED on the left end of the front panel (shown left) lights when power is on.

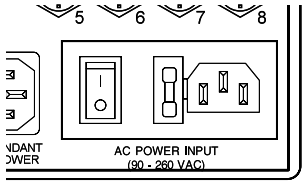


Figure 3-2. Matrix 100 Power Switch

Input and Output Buttons

The panel has a button and an LED for each input and each output. If the matrix is 4x4, only the four left input and output buttons and LEDs will operate. If the matrix is 8x4, all eight input buttons will operate, but only the four left output buttons and LEDs will operate. The best way to describe the Input and Output buttons is to use them in real examples with the other panel buttons. This is done on the pages that follow.

Each input button and LED also refers to a Preset number. Presets are discussed on the next page.

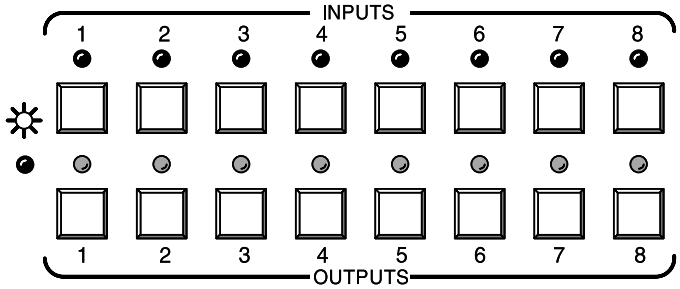
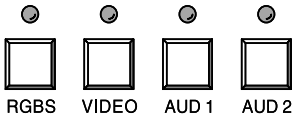


Figure 3-3. Input/Output Buttons and LEDs

I/O Module Select Buttons



The four buttons on the far right side of the panel are used to select the I/O modules to be viewed or configured. The buttons and LEDs will not operate if the corresponding modules are not installed in your Matrix 100. For example, if your unit does not have audio, the AUD buttons and LEDs will not operate.

When an I/O button is pressed, the associated LED for that I/O module will light to show that it is active. This "active" state remains in effect until that button is pressed again and the LED goes out – or power is removed. These buttons may be used independently or in combinations. For example, if you want to view or configure both RGBS and Audio (audio follow), press RGBS and AUD 1.

RGBS Button – This button selects the I/O modules for Red, Green, Blue and Sync modules to be viewed or configured. Here are some examples:

- *If your unit has RGsB (no separate sync), the RGBS button operates on the Red, Green and Blue signals.*
- *If your unit has RGB with composite sync, the button operates on the Red, Green, Blue and Sync signals.*
- *If your unit has RGBH and V (separate sync), the button operates on the Red, Green, Blue, Horizontal Sync and Vertical signals.*

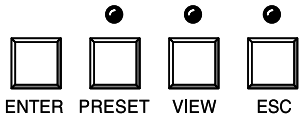
With RGBS active, switching configurations for RGB and Sync may be viewed or set up by pressing Input and Output buttons. See example on the next page.

Video Button – If the matrix has Composite Video, or S-Video, press this button to view or configure those signals.

AUD 1 Button – If the matrix has an audio module, this button allows Audio to be configured or viewed.

AUD 2 Button – This button is reserved for future use.

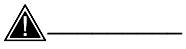
Control Buttons



Enter Button – This button is used to save changes when setting up a configuration. To set up a configuration, press the desired Input button, press the desired Output button(s), and then press Enter. See examples on next page.

ESC Button – The Escape button is used to end an operation and reset all of panel LEDs for Inputs, Outputs and Controls (active I/O Module LEDs remain on). The ESC button does not reset any configurations that have been entered.

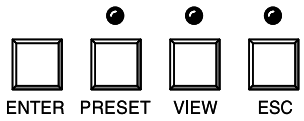
Preset – All current (active) configurations in the Matrix 100 may be stored as a Preset. To do this, press Preset twice (or hold the button for two seconds) and the Preset LED will blink. While the preset LED is blinking, press the Input button for the Preset number to be stored. The LED for that Input will light briefly, and then both the Input LED and the Preset LED will go out. (No output buttons will light.) The Preset has now been stored. There can be one preset for each Input button, for a total of eight – regardless of the number of available inputs or outputs.



The Input buttons and LEDs have two independent functions – as Input numbers and as Preset numbers. When using them to store or load a Preset, this has nothing to do with which inputs are switched to which outputs.

To load a preset that has been stored, press Preset once (briefly). The LED will light steady (**not** blinking). Press the Input button for the desired Preset number. That LED will light briefly, and then both it and the Preset LED will go out.

With Presets stored, the Matrix 100 can be configured again without affecting the stored Presets. This means that there can be eight matrix configurations stored as Presets, and a ninth one active. However, when a Preset is loaded, it destroys the active configuration.



View – Pressing the View button lights its LED for to indicate a "view-only" mode to allow the display of the current Matrix 100 configurations. In this mode, pressing any input or output button will also light all LEDs for the input and output(s) that are part of that configuration. Pressing a button for any unassigned output will light all of the unassigned outputs.

Using the View mode prevents changing configurations by accident.

Pages 3-4 and 3-5 have examples of Presets.

Example #1: Configuring the Ties for Input 2.

If necessary, press ESC to clear all Input, Output and Control LEDs.

1. Select I/O modules to be switched. (Example shows RGBS and Audio.)
2. Select the Input number. (Example shows Input 2.)
3. Select the Output(s) to be tied to the chosen Input. The Output LEDs will blink to indicate the tentative changes. (Example shows Outputs 2 and 5.)
4. Press Enter to complete the operation.

If an output had been tied to another input, that tie will be broken in favor of the new one.

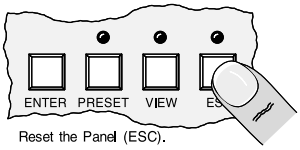
Tie – A connection between an Input and an Output.

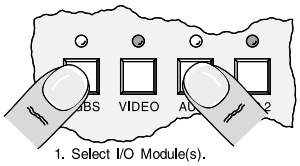
Set of Ties – More than one connection between one Input and more than one Output.

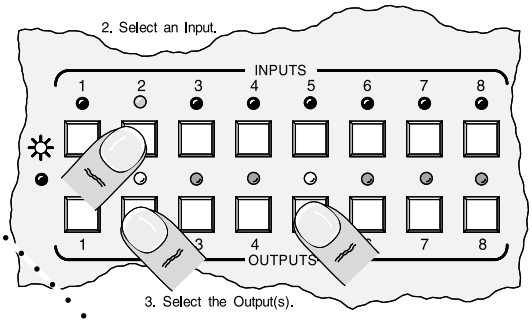
Configuration – Any Tie, Set of Ties, or Sets of Ties between Input(s) and Output(s).

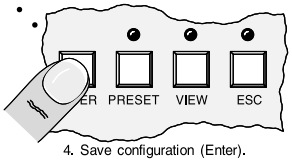
Active Configuration – The configuration that is currently being used by the Matrix 100.

Preset – A configuration that has been stored.





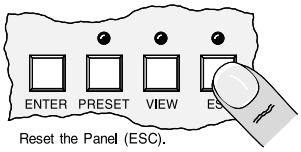


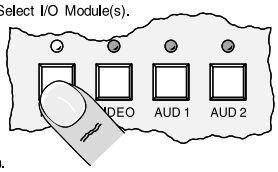


Example #2: Display the Ties for Input 5.

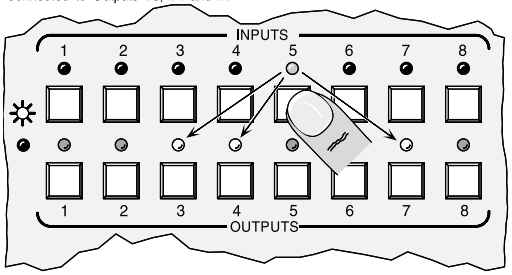
See picture, lower left.

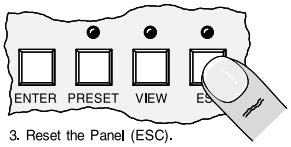
If necessary, press ESC to clear Input, Output and Control LEDs.





2. Press Input button. Example for RGBS, Input #5 connected to Outputs #3, #4 and #7.





1. Select I/O modules to be switched (example shows RGBS).
2. Select the Input number (example shows Input 5).

The LED(s) for the Outputs (numbers 3, 4 and 7) will light to show that they are connected to Input 5.

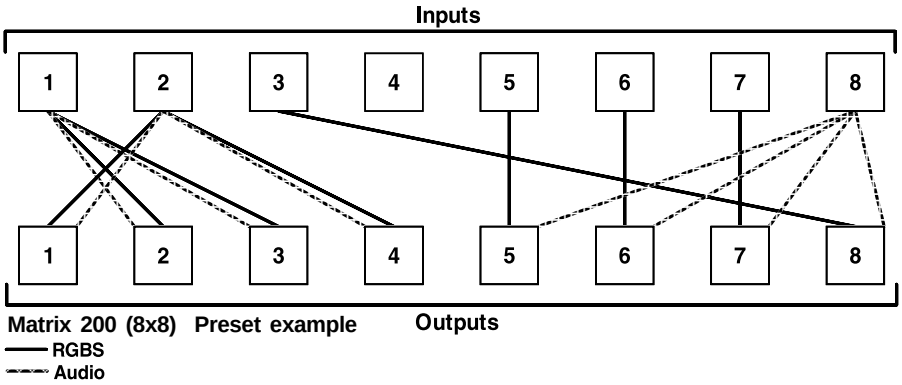
If an I/O module LED blinks when displaying ties, it means that the ties for that module are not the same as those for the RGBS module.

3. Press ESC to clear all Input, Output and Control LEDs.

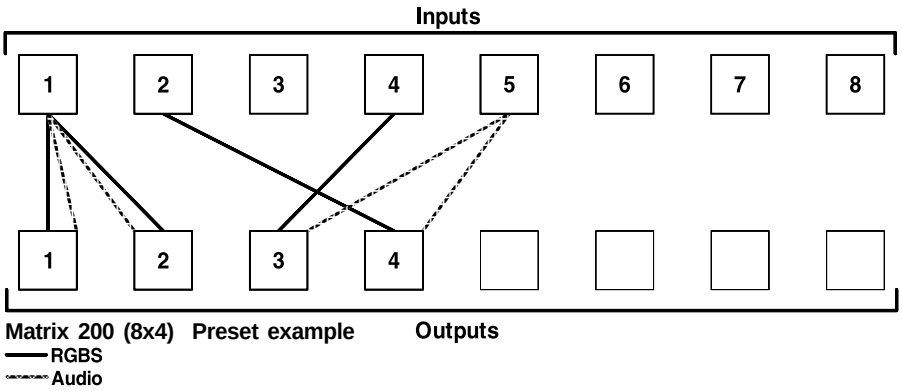
Ties, Configurations and Presets

Only one configuration may be active at one time, and only one Tie (or set of Ties) may be viewed at one time. Therefore, the only way to view each of the stored Presets is to load (activate) each preset and then view each set of Ties in that configuration (as shown in Example #2).

Example #3
This example shows a configuration with seven Ties, or sets of Ties. RGBS and Audio are shown as separate lines.



Example #4
This configuration shows a an 8x4 matrix with four sets of Ties. RGBS and Audio are shown as separate lines.



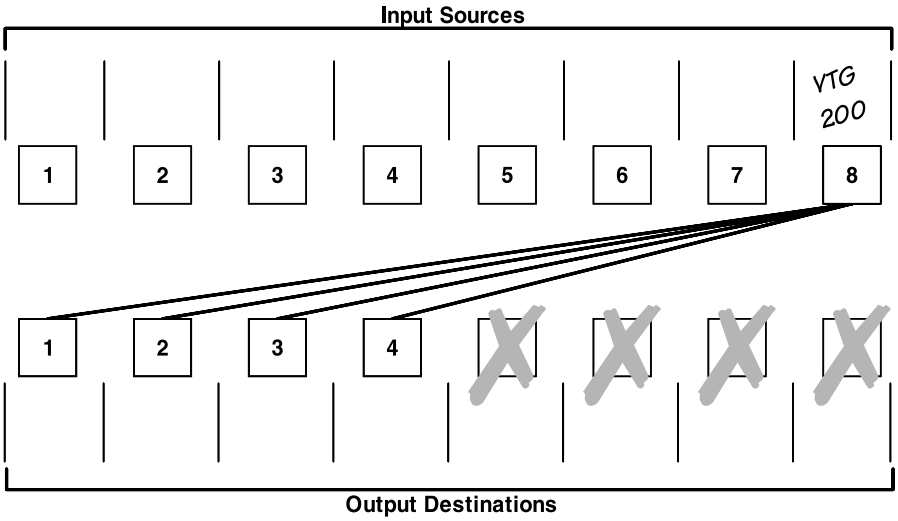
Rather than try to remember the configuration for each preset, worksheets may be used to record this information. Make copies of the worksheets are provided on the next page and use one for each Preset configuration.

Example #5
This configuration was stored as Preset 7. It has one set of Ties for Input 8. Because it was stored to do test patterns, only RGBS is tied to the Video Test Generator source.

When diagramming for more than one I/O module, use different colors for each I/O module.

For our own records, we chose the title “Test Patterns”.

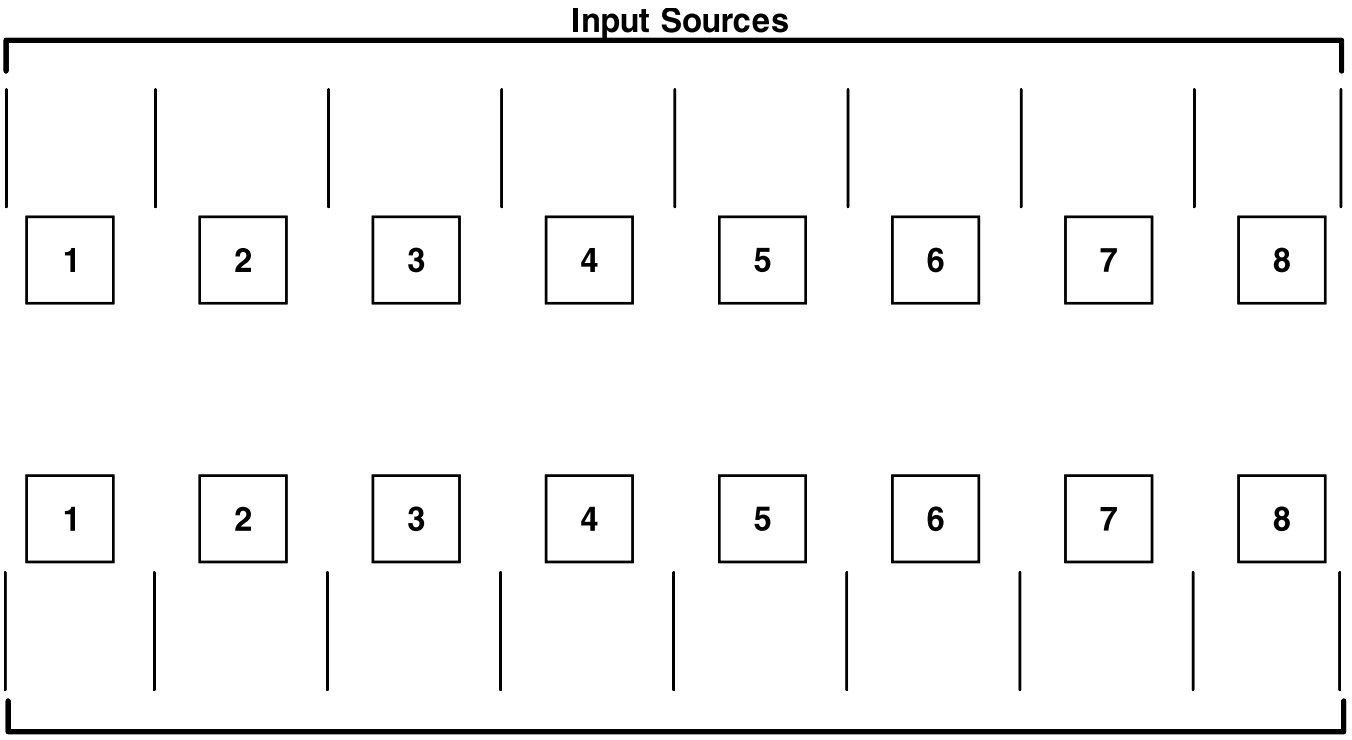
Because the matrix is 8x4, outputs 5 - 8 have been crossed out for this example.



Matrix 200 Configuration Worksheet

Preset # 7 **Title** *Test Patterns* **RGBS** _____ **Audio** _____ **Video** _____

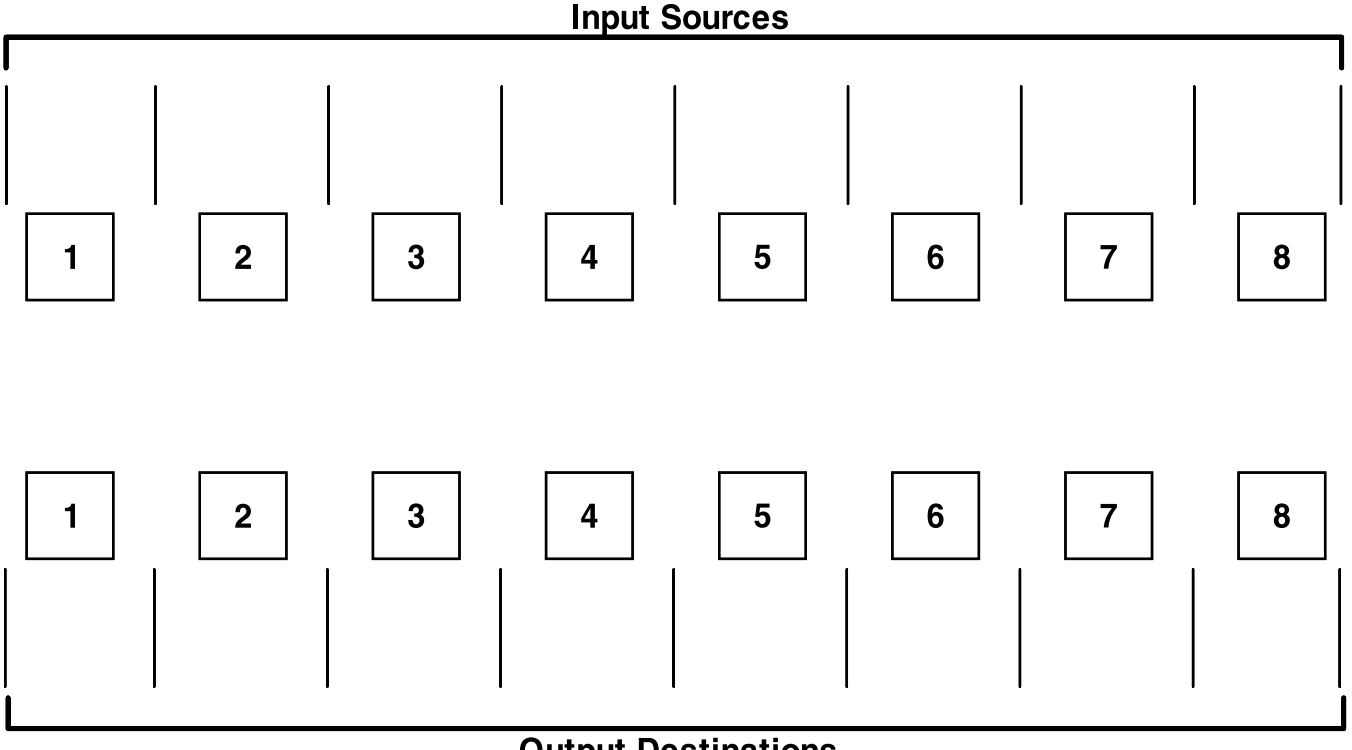
Fill in Preset number and colors (or codes) used to make connecting lines for each I/O module type.



Matrix 200 Configuration Worksheet

Preset # _____ **Title** _____ **RGBS** _____ **Audio** _____ **Video** _____

Fill in Preset number and colors (or codes) used to make connecting lines for each I/O module type.



Matrix 200 Configuration Worksheet

Preset # _____ **Title** _____ **RGBS** _____ **Audio** _____ **Video** _____

Fill in Preset number and colors (or codes) used to make connecting lines for each I/O module type.

Chapter Four
Hardware Installation

IEC Power Panel

Removing the Matrix 100 Cover

Installing QuickSwitch™ Front Panel

RS-232/RS-422 Connections

Installing Redundant Power Supply

Installing I/O Modules

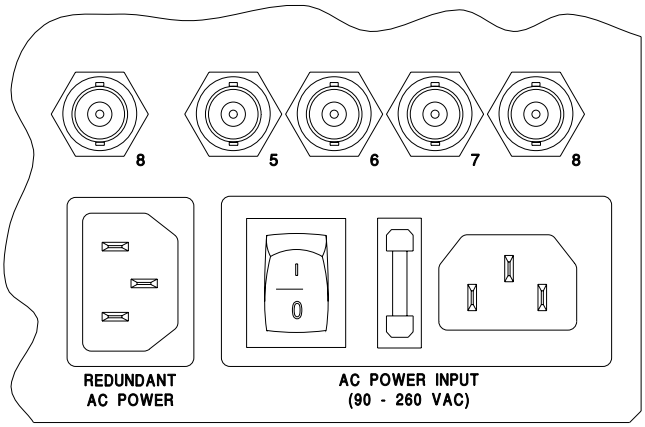
This chapter covers only the installation of the Matrix 100 hardware. Connecting its inputs and outputs is covered in Chapter 3 and setup is Chapter 4.

IEC Power Panel

The IEC Power Panel consists of an On/Off switch, a fuse cover and two male power connectors. (See Figure 4-1.) The second connector is provided for a Redundant power supply.

Standard Power Supply

The Matrix 100 Series switcher/router has an auto-switching power supply that operates from any input voltage from 90 to 260 VAC, 50/60 Hz. No equipment changes are necessary.



Fuse

Fuse Type = 5mm x 20mm
Fuse Rating = 240V, 0.8A Super Slo Blo

Power Switch

Power Switch - 1 = On
0 = Off

Figure 4-1. IEC Power Panel: Power Switch, Fuse and Power Connectors

Redundant Power Supply (optional)

To improve equipment reliability in critical applications, the Matrix 100 can be configured with a redundant internal power supply. With this option, the Matrix 100 will automatically switch to the backup supply if the primary supply fails. If the Matrix 100 switches to the backup power supply, it continues to operate without interruption, and sends a command to the Host system to indicate a change in status. If the Matrix has a QuickSwitch Front Panel Controller, the Power LED will flash to alert the user that a power failure has occurred.

To install this optional power supply, see procedure on page 4-5.

QuickSwitch Front Panel Controller

The QuickSwitch Front Panel Controller (QS-FPC) provides local control of all Matrix 100 functions. This optional feature is intended to supplement normal RS-232 computer control with a local or remote operator control.

The following pages include procedures for panel installation.

Removing the Matrix 100 Cover

Use this procedure to prepare the Matrix 100 for making any hardware changes that require access to the inside of the unit.

The ambient temperature of the rack should not exceed 50° C. To insure proper ventilation, we recommend that you allow a minimum of one rack unit spacing above and one below the Matrix 100, if forced air cooling is not used.

1. Turn off input power to the Matrix 100; disconnect power cord(s).
2. If the Matrix 100 is rack-mounted, remove it and place on a clean workspace.
3. Remove the six screws that hold the Matrix cover. Lift the cover-half straight up to expose the Main Controller board inside. (See Figure 4-2)

When changing a front panel, the side panels may move when the panel is off, misaligning the panel screws with the mounting holes. With the top cover off, move the sides, if necessary, to align the holes. After the new front panel is mounted, replace the top cover.

4. Go to the appropriate installation procedure.

Take care to remove the four spacers from the rear of the panel.

Avoid ElectroStatic Discharge

Things that cause static electricity:

1. Materials such as clothing, carpet, shoe soles, packaging, etc. rubbing together.
2. Low humidity adds to the problem.

Ways to prevent static buildup:

1. Best – Wear an ESD wrist strap that is grounded to the metal chassis or frame of the Matrix 100.
2. Don't touch **any** IC chips unless it is absolutely necessary.
3. Touch the metal frame, or chassis **before** (and while) working near sensitive electronic components. This discharges static buildup from your body.
4. Avoid movements (shifting, sliding, walking, scratching, rubbing, etc.) during the time you are working near sensitive electronic components. Again, the movement of clothing, shoes on carpet, etc. will generate more static.

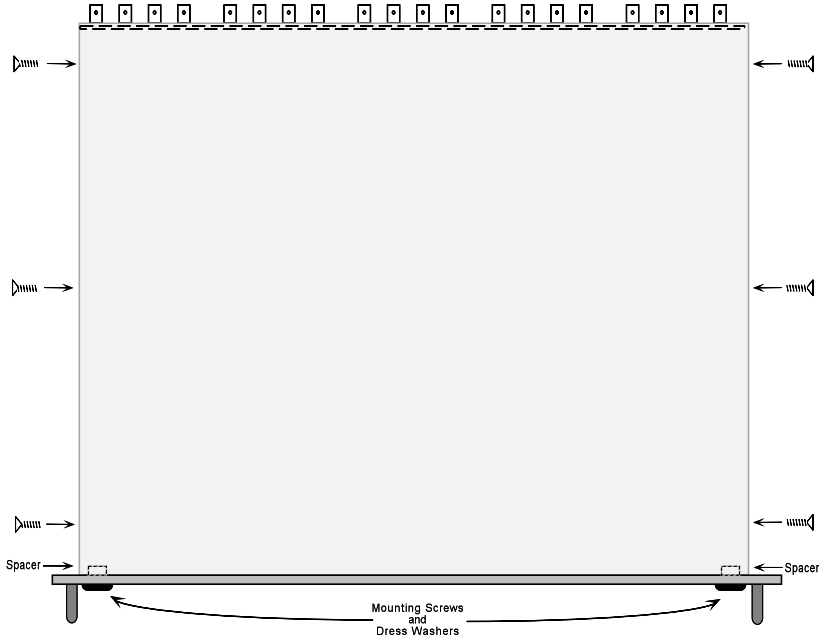


Figure 4-2. Matrix 100 Cover has six screws.

Changing Matrix Front Panels

All Matrix 100 units ship with either a QuickSwitch Front Panel Controller (QS-FPC) or a Blank Front Panel. There may be a need to change this configuration, such as:

- *If the QuickSwitch Front Panel Controller (QS-FPC) is to be removed, for example to install it remotely, a blank front panel must be installed in its place.*
- *If the Matrix 100 Series Switcher is presently configured with the blank front panel and the optional QuickSwitch Front Panel Controller (QS-FPC) is to be installed.*

If there is a need to change this configuration, refer to "Removing the Matrix 100 Cover" (above), and use the appropriate procedure from the following page.

Replacing a Blank Panel with a QuickSwitch Front Panel Controller

Installing a front panel may be easier by placing the Matrix face-up, being careful to protect the BNC connectors from damage. See Figure 4-4.

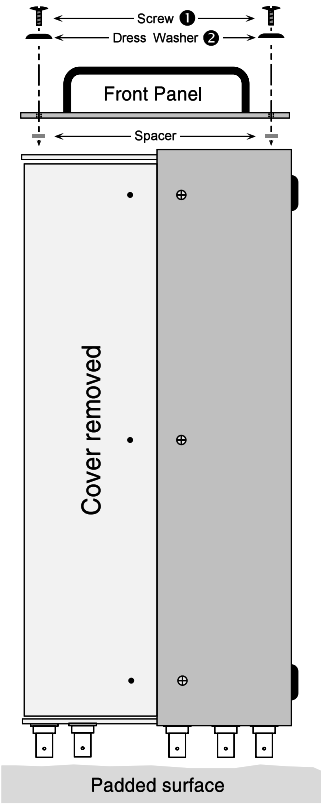


Figure 4-4. Matrix 100, face-up

After removing the Matrix 100 cover, remove the Blank Front Panel as follows:

1. Remove the four screws and dress washers (items ❶ & ❷ in Figure 4-4) from the existing front panel. Take care to remove the four spacers from the rear of the panel.
2. When removing the blank panel, disconnect the Power Indicator cable from J13 on the right side of the Main Controller board. See ❸ in Figure 4-3 (right).

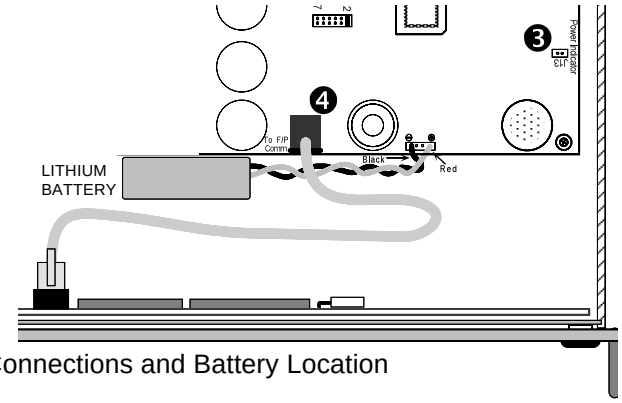


Figure 4-3. Front Panel Cable Connections and Battery Location

3. Remove the Blank Front and set it aside.
4. Position the QS-FPC on the front of the Matrix 100, with a spacer behind each screw. Install the four screws and dress washers (items ❶ & ❷).
5. Connect the modular cable from the plug on the QS-FPC to the RJ45 connector on the Matrix 100 Main Controller board. See ❹ in the picture above for the RJ45 connector location.

Circuits may be damaged by using the wrong RJ45 cable. See Figure 4-5 for correct orientation of cable conductors.

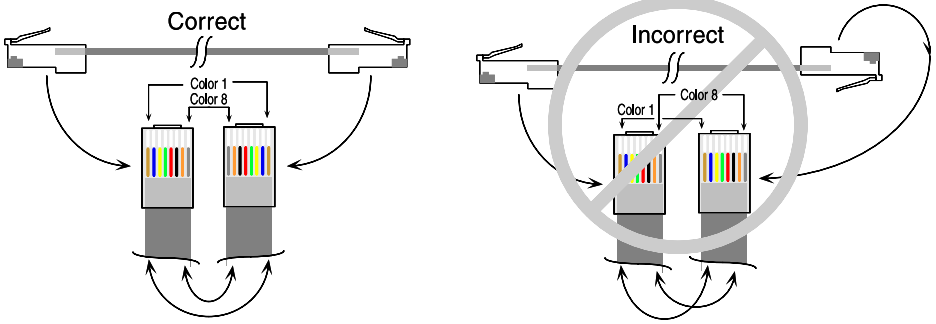


Figure 4-5. Wiring the RJ45 Cable

6. Refer to page 4-2 when reassembling the Matrix 100.

Operating instructions for the QS-FPC are found in Chapter 3.

Replacing the Lithium Battery

With the power disconnected and the cover removed (refer to page 4-2), locate the battery as illustrated in Figure 4-3. Disconnect the red and black battery cable from the Main Controller board by pulling on the connector. You may then remove the battery which is attached on the bottom with a Velcro™ fastener. Please heed any warnings on the battery concerning its proper disposal. Install the correct type of replacement battery, attach the battery cable to the board, and replace the cover.

Changing the Main Fuse

To change the AC power fuse, you must first unplug the IEC power cable. This allows access to the fuse holder. Use a small, flat screwdriver to press into the notch and pull the holder straight out. There is a storage place for a spare fuse. Replace the blown fuse (see picture left) and slide the fuse holder until it snaps in place.

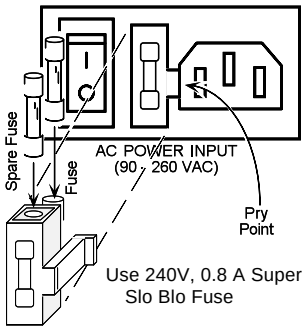


Figure 4-6. Changing the Fuse

There is also an AC fuse on each of the two boards that make up the power supply. Each fuse is located next to the AC input connector. These fuses are accessible by removing the top cover of the Matrix.

RS-232/RS-422 Communications

The Matrix 100 can be controlled by a host system, through an RS-232 or an RS-422 interface. The interface allows the user to write programs to configure and automate the operation of the Matrix 100. This includes making changes dynamically when commanded by the host controller, as well as informing the host of the Matrix status. Certain important changes in status are reported to the host automatically. For additional programming information, see Appendix A.

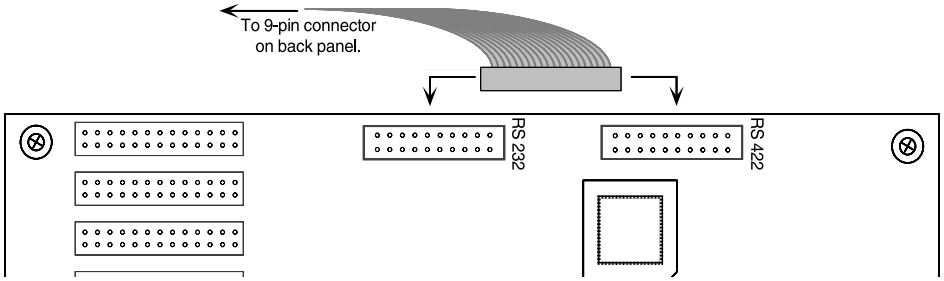


Figure 4-7. Swapping the RS-232/RS-422 Port cable

The rear panel of the matrix has one 9-pin connector labeled RS-232/RS422. Main Controller board provides two connectors – one for RS-232 and the other for RS-422. Each matrix ships with the cable connected to the RS-232 port. If your system uses RS-422, you may change this connection. See page 4-2 for instructions on removing the Matrix 100 cover.

9-Pin Communication Connector

The RS-232/422 connector is a standard 9-pin D female with the following pin designations:

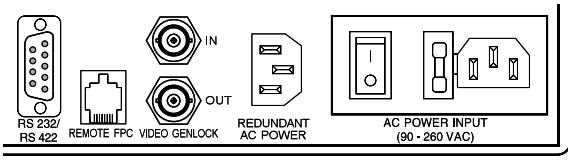


Figure 4-8. Matrix 100 Comm Connector

Pin	RS-232	Description	RS-422	Description
1	n/c	No Connection	TxD(-)	Transmit Data (-)
2	Tx	Transmit Data	TxD(+)	Transmit Data (+)
3	Rx	Receive Data	Rx(+)	Receive Data (+)
4	n/c	No Connection	Rx(-)	Receive Data (-)
5	Gnd	Signal Ground	Gnd	Ground
6	n/c	No Connection	n/c	No Connection
7	n/c	No Connection	n/c	No Connection
8	n/c	No Connection	n/c	No Connection
9	n/c	No Connection	n/c	No Connection

RS-232 Protocol

The RS-232/422 baud rate is fixed at 9600-baud, 8-bits, no parity, 1 stop bit. It also used X-on/X-off handshaking.

Installing a Redundant Power Supply

To install a redundant power supply in a Matrix 100, disconnect the power source, remove the Matrix from its rack mount, and place it on a clean workspace. Refer to page 4-2 to remove the cover. With the cabinet open, do the following:

1. Mount the new power supply on the four bolts projecting up from the bottom of the cabinet and secure it with four nuts. This position is parallel to that of the primary power supply. (See dotted lines in picture.)

2. Connect the two twisted power cables from the second IEC connector to the inputs on the new power supply boards. See dotted lines in picture below.

3. Connect the two black power output connectors (6-pin) to the two vacant power connectors on the main controller board, next to the connectors from the primary supply.

4. Check the mounting and connections by comparing them with those for the primary supply.

⚠ _____ *Be sure that the striped green Ground wires are connected as shown to the left.*

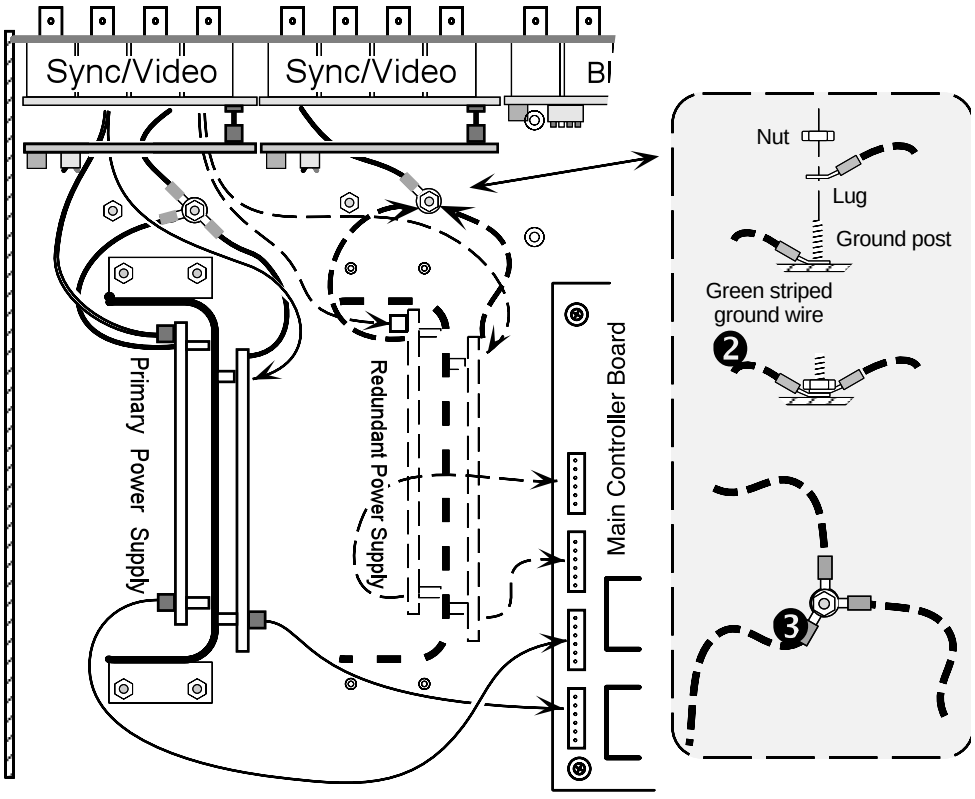
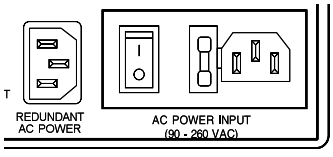


Figure 4-9. Connecting the Redundant Power Supply and Ground Wire Connections (Right detail)



5. Put the Matrix 100 back together and connect **both** AC power sources.

6. To check the operation of the redundant supply, turn the AC switch Off. The Matrix should function normally using the redundant power supply and the Power LED should blink. If using an RS-232 interface, the Matrix Status Bytes will indicate this change in condition.

Figure 4-10. Redundant Power Supply Connector

Like the Primary power supply, the Redundant supply has a 4-amp, fast-blo fuse at the AC input of each board (inside the matrix).

Adding an Audio Module

⚠ _____ *Do not do this procedure unless your Matrix 100 is up to date.*

Tools for Installation:
- 3/16" flat screwdriver
- #4 Phillips screwdriver
- #6 Phillips screwdriver
- Wire cutters

1. Remove the Matrix top cover (procedure on page 4-2).

2. Locate the gray ribbon cables that connect the Main Controller board to the existing I/O modules (Red, Green, Blue and Sync/Composite Video). Note the orientation of the red stripe on each ribbon cable and unplug both ends. If necessary, cut the ties that bind them together. It is not necessary to mark the cable connections; this will be covered later. Put the ribbon cables aside.

3. On the rear panel, remove the two screws (See ❸ in Figure 4-11.) that hold the right end of the blank cover. (Tabs hold the left end.) Remove the cover and put the screws back in the same holes. This reveals two long, parallel access slots. These will accommodate the upper and lower sections of the Audio Module.

Audio Option Kit:
- Qty - Description
- 1 - Audio Module (❻)
- 6 - 0.685" Nylon Spacers (❹)
- 6, 1-5/8 Screws (❹)
- 3" Ribbon Cable (❷)
- 16 - Phoenix Connectors (❺)

Check the installation parts list and identify them by their location in Figures 4-11 and 4-12.

4. Unpack the six 0.685" nylon spacers and slip one over each of the six mounting posts in the bottom of the cabinet. (See ❹ in Figure 4-11.)

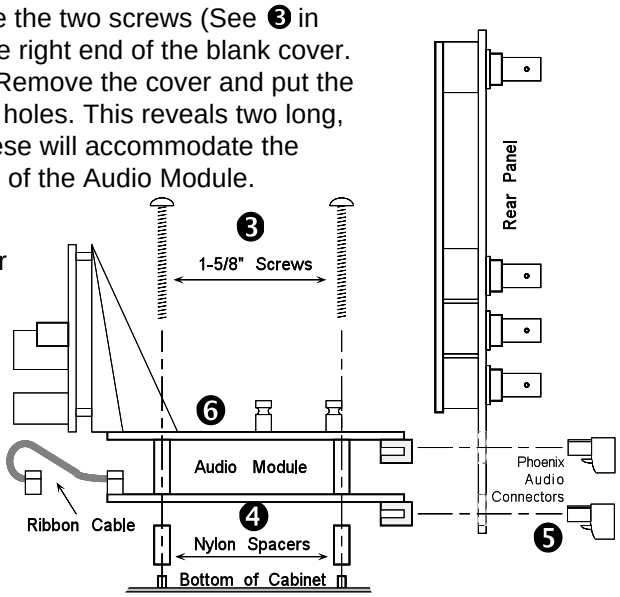


Figure 4-11. How the Audio Module fits in the Matrix

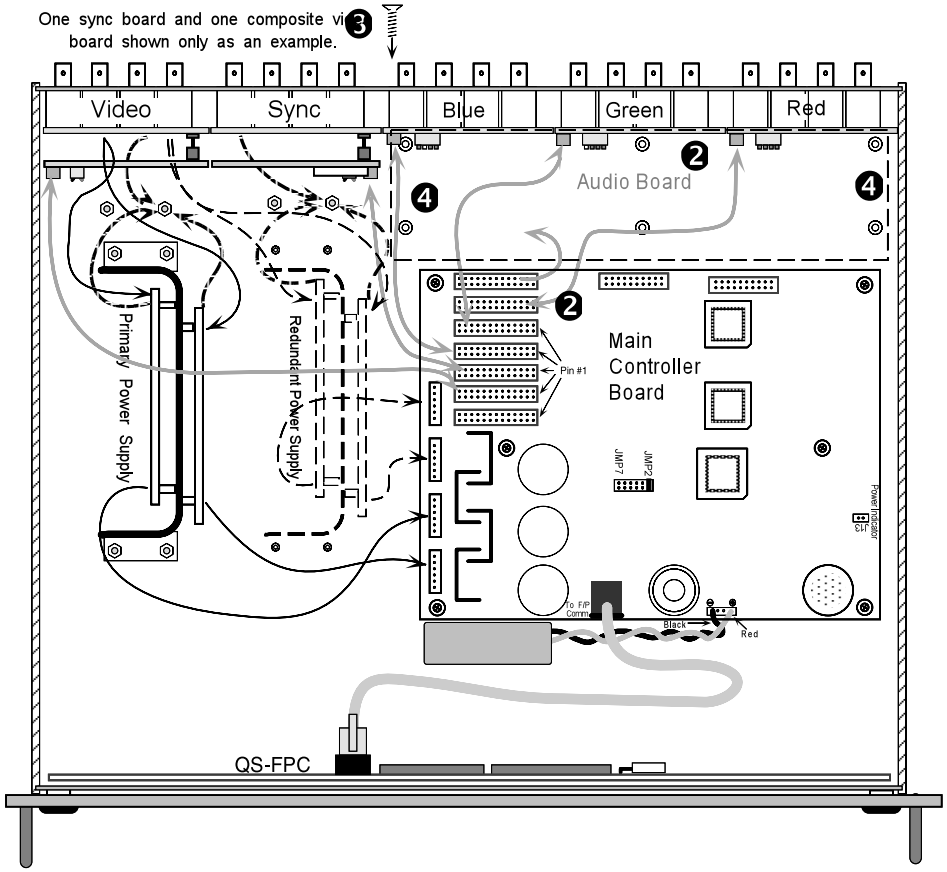


Figure 4-12. Audio Module connections and hardware

5. Unpack the Audio Matrix module and locate the following:

- The bracketed attachment is the power supply.
- Two rows of female Phoenix audio connectors, eight in each row. Six pins per connector.
- Board address DIP switches. (See Figure 4-13.)
- 3-inch ribbon cable attached. (Not visible in the picture to the right.)

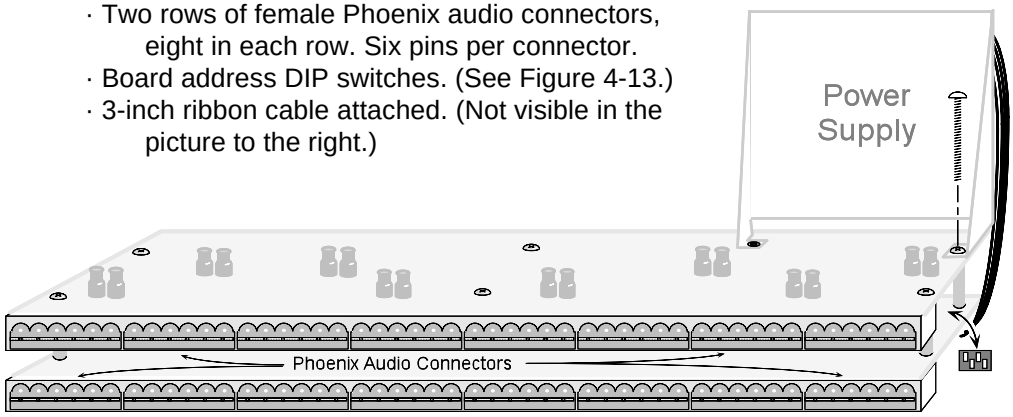


Figure 4-13. The Matrix Audio Module before installation. (Address DIP switches are at far right end.)

The address DIP switches are factory-set. See right end of picture above. They should be set to represent an address of five (0101 binary).

6. Remove the six nuts from the screws that hold the two boards together. Set the screws and washers aside; the nuts will not be needed. (See Figure 4-12.)

7. Slide the rear panel upward about 3/4", while keeping it in the cabinet grooves. (See Figure 4-14.)

8. Orient the Audio Module above the Nylon Spacers, with the audio connector strips to the rear. Tilt the module slightly and slip the audio connectors through the parallel openings in the Rear Panel and lower it to a horizontal position. (See Figure 4-14, bottom-right.)

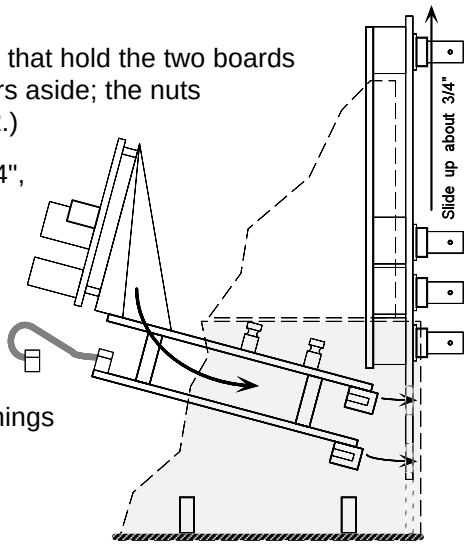


Figure 4-14. Lift the Back Panel slightly and slip the Audio Module under it.

9. While holding the Audio Module in position with the Rear Panel, lower them both carefully until the module rests on the six nylon spacers in the bottom of the cabinet. (See Figure 4-15.)

10. With the Audio Module loosely in position, lift the corner by the power supply slightly and plug the ribbon cable into the nearest slot (J4) on the Main Controller board.

The I/O connectors on the Main Controller board are on a parallel bus, therefore it doesn't matter which module is plugged to which connector. Because of its cable length, the Audio Board must plug into the closest connector.

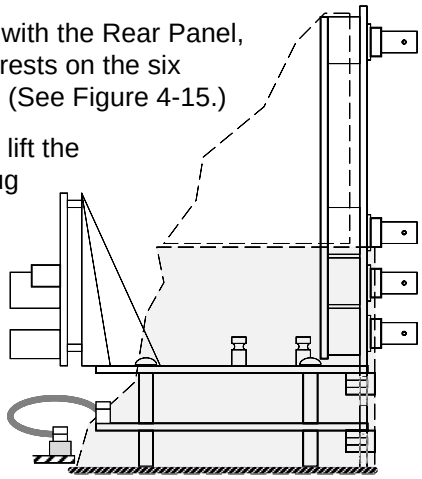


Figure 4-15. Secure the module in position.

11. Plug the remaining I/O Ribbon cables from each module to a connector on the Main Controller board. Since the Main Board connectors are the same, connect the cables for neatness and convenience. For example, the illustration below shows the Red I/O module connected to J5, the Blue to J6, etc.

⚠ _____ *When working close to the other I/O modules, be careful that you do not change any other DIP switch settings.*

12. Be sure the cables are securely plugged into the Main board, and then drop the six screws into the six holes in the Audio Module. Wiggle each screw by hand to align it with the threads below and tighten them with a screwdriver.

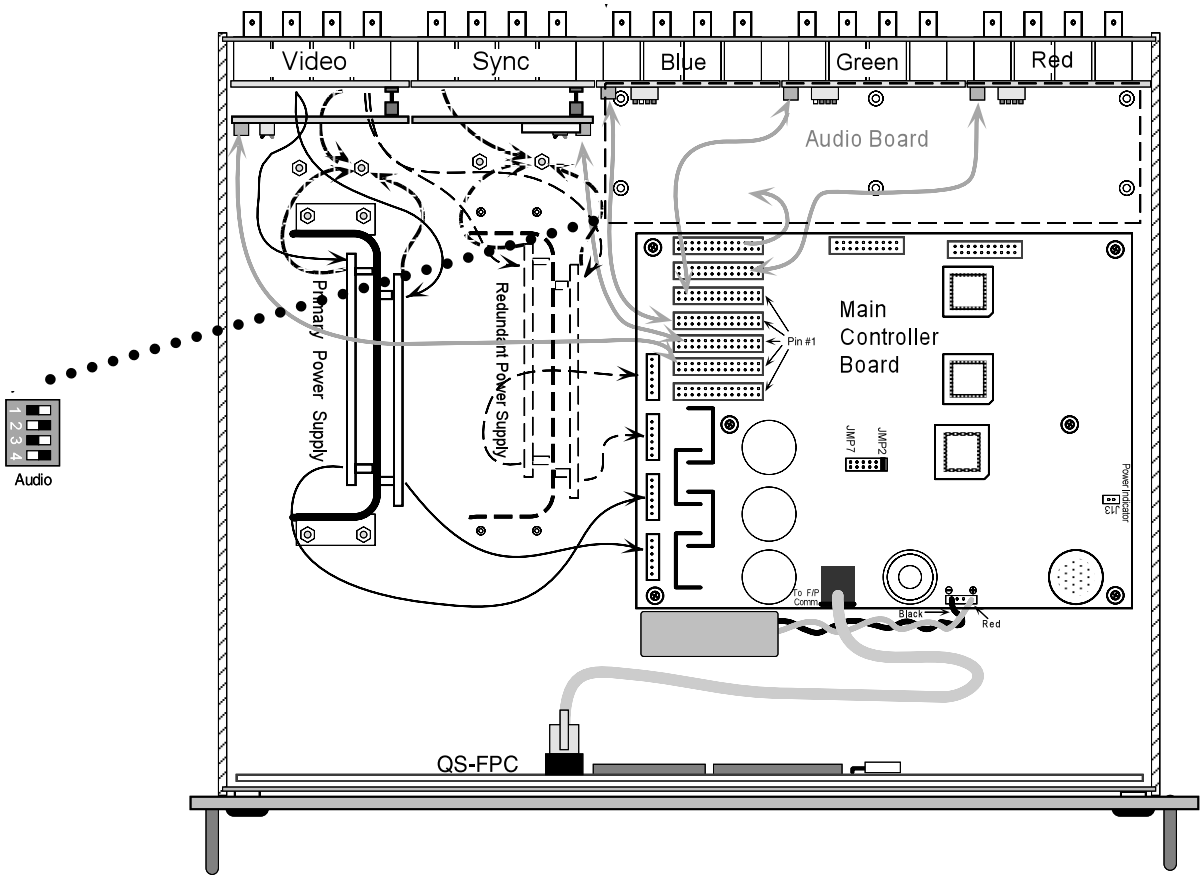


Figure 4-16. Plug the Ribbon Cables from each module to the Main Controller board.

⚠ _____ *The red stripe on the ribbon cables (pin 1) is to the **right**, on the Main Controller and Audio boards. (See the picture below.) It must point **up** on the other I/O modules.*

13. With all connections and screws secure, dress the cables away from the power supplies. Use tie wraps to tie cables together where they follow the same path.

14. If no other modifications are required, put the top cover back on the Matrix 100 and put it back in its working position.

The new configuration will also appear in Request ID information sent to the Host system via the RS-232 port.

If other modifications are required, go to the appropriate procedure.

Installing I/O Modules in the Rear Panel

Tools for Installation:
- 3/16" flat screwdriver
- #4 Phillips screwdriver
- #6 Phillips screwdriver
- 9/16" Socket/nutdriver

There are three types of modules that can be installed in the rear panel of the Matrix 100: MRAM module, for RGB; Sync module, for Horizontal and/or Vertical Sync; and Composite Video module for Composite Video or S-Video. Positions, or "planes" 1, 2, and 3 will accommodate only MRAM modules. Planes 4 and 5 will accommodate either Sync or Composite video modules, but not MRAM. A Matrix unit cannot have one or two MRAM modules; it must have three (for red, green and blue) or none. The modules could be 4x4, 8x4 or 8x8.

Use this procedure to install any MRAM, Sync or Composite Video module. Locate the position on the back panel for the new module. An MRAM can only be installed in the locations marked Red, Blue or Green. A Sync module, or a Composite Video module can only be mounted in the positions marked as such. If there is one sync module, it must be in the fourth position (Plane 4).

Configuration	plane 1	plane 2	plane 3	plane 4	plane 5
RGsB	MRAM	MRAM	MRAM	-	-
RGBS	MRAM	MRAM	MRAM	Sync	-
RGBHV	MRAM	MRAM	MRAM	Sync	Sync
RGsBSCv	MRAM	MRAM	MRAM	Sync	C-Video
1 Cv	-	-	-	(could be here)	C-Video
2 Cv or 1 YC	-	-	-	C-Video	C-Video

Audio can be included with any of these combinations.

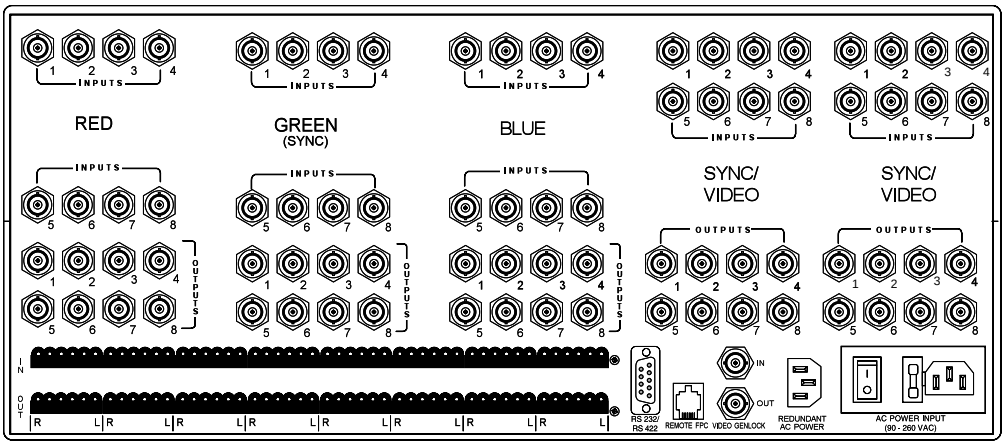


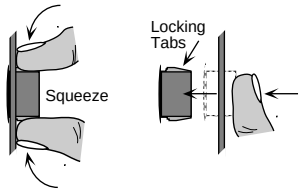
Figure 4-17. This illustration shows the modules already installed.

Address switches are set according to the physical location.

Back panel markings, such as "Sync" or "Video" should show what is installed in the Matrix 100. If an I/O module was added or changed to another type, peel off the black covering to show the proper module identification.

1. Remove the Matrix top cover (procedure on page 4-2).

2. Locate the gray ribbon cables that connect the Main Controller board to the existing I/O modules and determine where the new module will be connected. If cables from adjacent modules are in the way, they may be unplugged and reconnected later.



3. On the rear panel, remove the round plastic plugs (as many as required) from the holes where the new module will be installed. (See Figure 4-20.)

Figure 4-18. Squeeze the tabs to release the plug.

4. On the new module, remove the nuts from the BNC connectors.

If installing both a Sync module and a Composite Video module, the Sync module must be in Plane 4 and the Composite Video in Plane 5.

There are physical differences between these two modules. The Sync module has components some places on the insides of the boards, where the Composite Video module has none.

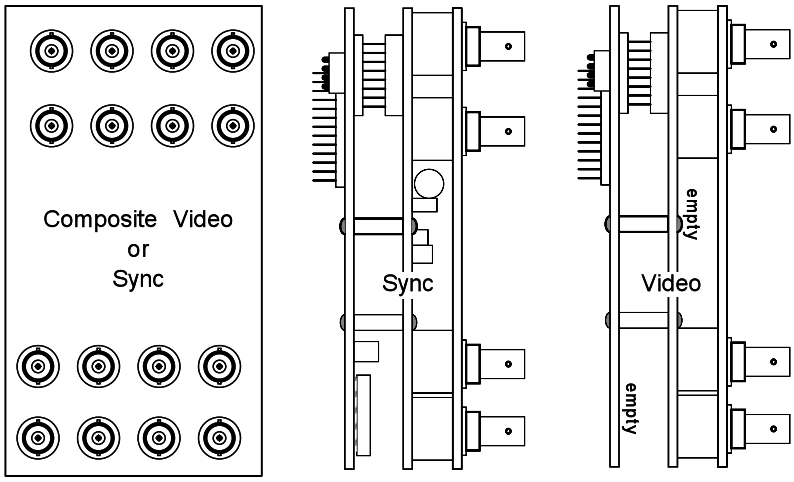


Figure 4-19. Module differences

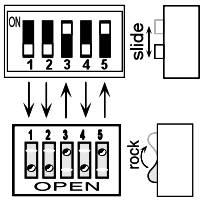


Figure 4-20. DIP Switch operation

5. Mount the module by inserting the BNC connectors through the holes in the rear panel and secure it in place with the nuts. (Use 9/16" socket.)

6. Check to be sure the address DIP switches are set for the correct Plane number. These switches are set at the factory but their settings should be confirmed.

The address switch settings are shown to the left, with their orientation as seen from the front of the Matrix 100.

7. Carefully support the I/O board while pushing the ribbon cable onto its connector (Red stripe up). Connect the other end to the Main Controller board. The connectors on the Main Controller board are the same, therefore the cables can be arranged for neatness. Note the orientation of the red stripe (pin 1) is to the right when looking from the front of the Matrix.

8. After rechecking all connections, put the cover on the Matrix 100 and secure it with the six screws. (See page 4-2.)

Figure 4-21. DIP Switch settings for each module

The new configuration will also appear in Request ID information sent to the Host system via the RS-232 port .

The picture to the right is for an MRAM module.

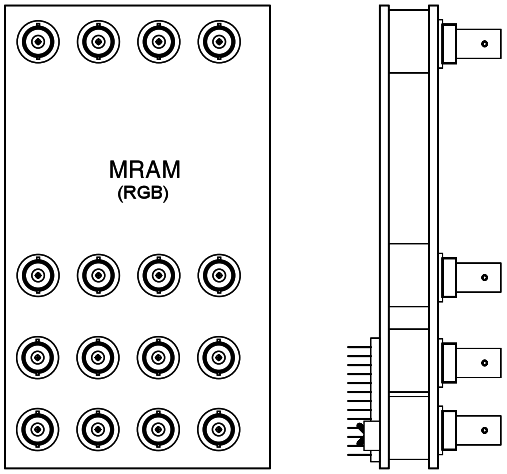


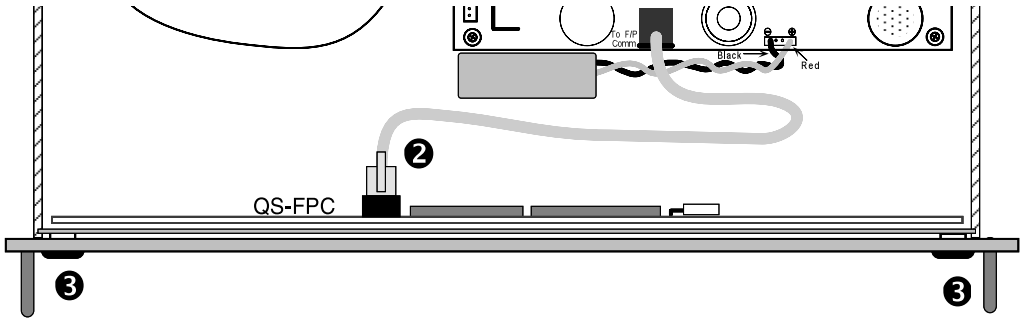
Figure 4-22. MRAM Module

Installing QS-FPC Software Update

1. If the QS-FPC in mounted on the Matrix 100, see the procedure on page 4-2 to open the cabinet and then continue with step 2.

_____ *Electro-Static Discharge (ESD) can damage IC chips, even when it is not enough to be humanly detected (felt, heard or seen). Do NOT touch IC chips without being electrically grounded. (Read warning on page 4-2.)*

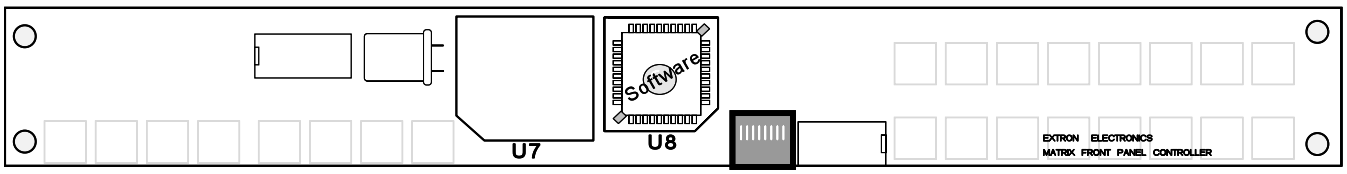
2. With the top cover off the Matrix, unplug the cable that connects the Front Panel to the Main Controller board and put it aside.



3. Remove the four (4) screws that hold the QuickSwitch Front Panel Controller (QS-FPC) to the Matrix cabinet.

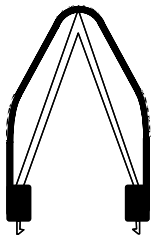
Figure 4-23. Remove the Front Panel to access the Software IC Chip.

4. Place the QS-FPC face down on a clean workspace. If necessary, place it on a soft pad to prevent damage.



_____ *Be sure you are electrically grounded.*

Figure 4-24. Use the PLCC Chip Puller to remove the Software IC Chip.


PLCC Chip Puller

5. Use the PLCC IC puller to remove the old Software chip. Squeeze the tool to align the hooks with the slots provided in opposite corners of chip socket U8. Insert the hooks, squeeze gently and pull the IC straight out of the socket. Set the chip aside.
6. Note the orientation of the angled corner of the new Software chip. Orient this to match the angled corner of the socket and carefully press it in place.
7. Reinstall the cover on the back of the QS-FPC, and reverse the above procedure to put the Matrix back in place.

5

Chapter Five

Windows® Control Software

Installing the Software

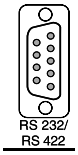
Operating Examples

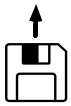
Using Help

Extron Matrix Control Software

Extron supplies controller software that runs in the Windows® operating system, version 3.1 or later. Install the software from the 3.5" floppy disk, just like any other Windows application. (Run Setup.exe from the floppy disk.) This software, called "Matrix 100/200 Control Program", works with both the Matrix 100 and Matrix 200 switchers. Its operation will be restricted to the features and configuration of your Matrix.

Communication between the computer software and the Matrix is done after connecting the computer to the RS-232/RS-422 Port on the rear panel of the Matrix 100. See Page A-1 for more information on this port.





Installation of the software creates a Program Group (Windows 3.1) or a Folder (if Windows 95®) called "Extron Electronics". Icons for the Control Program and the Help Program are installed in that group, or folder. Examples follow.

The Window below shows an Extron Program Group. This example is from Windows 3.1, and it includes Extron's VTG 200 Control Program installed; you may not have the VTG 200 Software. (VTG = Video Test Generator)

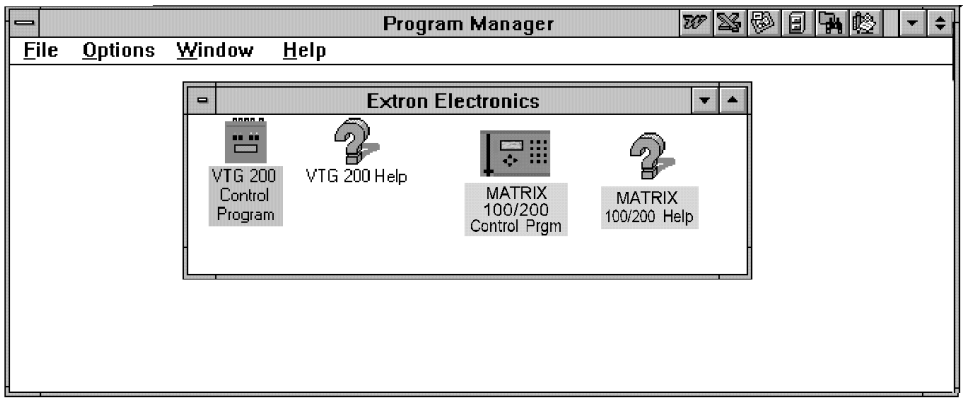


Figure 5-1. Extron Windows Group Example

Windows Example

With the Matrix 100/200 Control software installed, double-click on the icon. You will be asked to select the PC's Comm Port. When communications has been established, the Matrix Control Software will "read" your matrix.

Although detailed Help is provided in the software, this section of the manual is to inform the user as to what is available. Remember that this software is for more than one Matrix. Your version may not look exactly like these examples.

This will open a Control Program Window. (The following example is blank.)

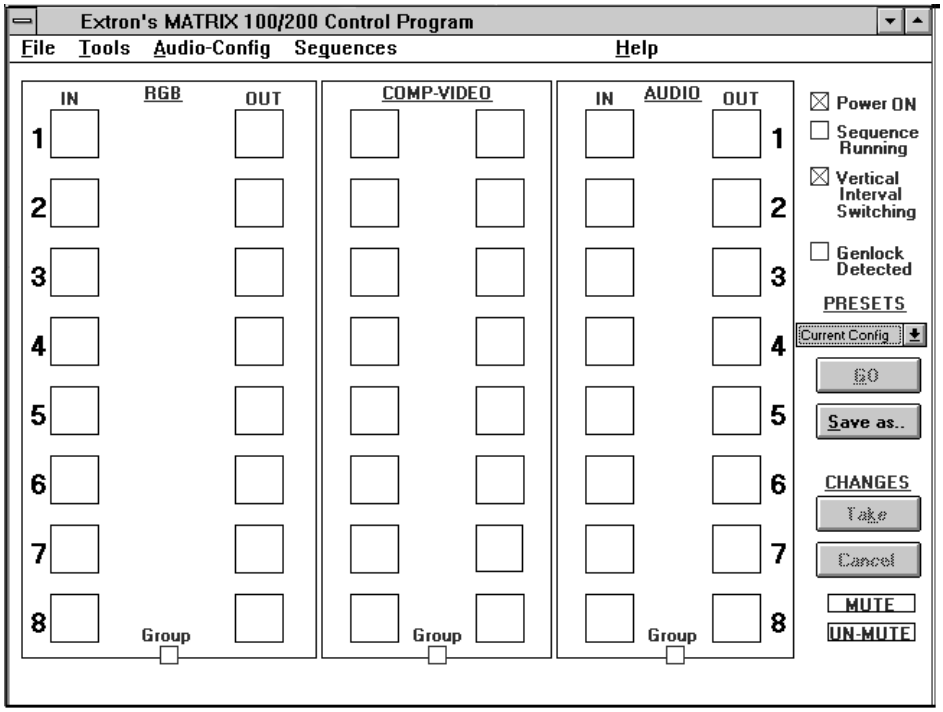


Figure 5-2. Control Program Example

Drag an Input box to an Output box to make a “Tie” or connection.

Clicking on an Input or an Output box will open an appropriate dialog box with a choice of icons for either Input Devices or Output Devices. Click on the desired icon to assign it to the selected Input or Output. A Text Box at the bottom, marked “Caption”, allows the user to type in a name for that device. Click “Ok” to close the dialog box.

Below is an example of a Matrix Control Program Window complete with assigned Icons, Captions and Ties, or connections.

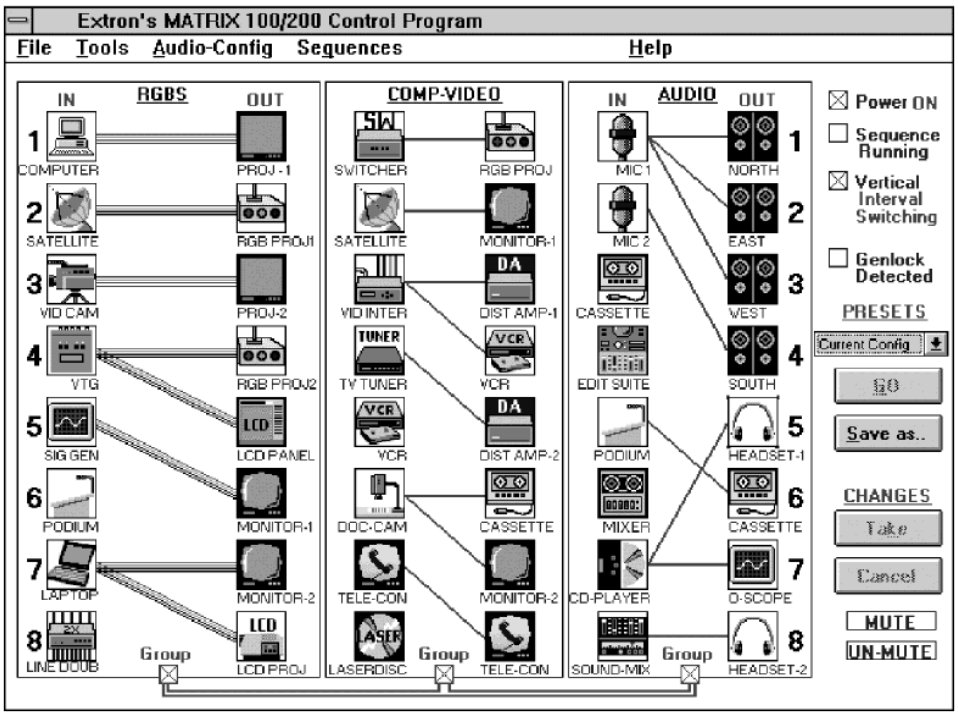


Figure 5-3. Configured Matrix Example

Matrix 100/200 Help

Double-click on the Help Icon (or press F1 at any time) to open the Help Window. Below is an example of how this might look like.

As with all Windows® Help files, clicking on the underlined words will give more detailed help.

Extron's Matrix 100/200 Help Contents

To learn how to use Help, press F1 or choose Using Help from the Help menu

The Matrix Control program communicates with the Extron Matrix 100 and 200 Switchers through the unit's RS-232/422 port (defaults to 9600 baud, 8 bit, 1 stop, no parity). It presents the same functions found on the Front-Panel controller, but in an interactive graphical interface. Because settings to the Matrix (Ties, Presets, Sequences, Audio config) are stored in the unit's memory, several modes of 'programming' are possible. It provides 4 major methods:

- Remote control and programming of the unit in real time through the RS-232 port.
- Saving unit's settings for later restoration to the same unit (backup) or copying to (programming) another unit. Multiple configurations (programs) can be saved to disk and any one quickly reloaded later, providing an unlimited number of possible setups.
- Creating Program byte-strings for application to the Matrix through a third-party control system.
- Emulation (off-line) programming of the unit's settings for copying to the unit at a later time or another place. Emulation mode also allows creation of programs for any possible Matrix hardware configuration without being connected to such a unit.

To load a demonstration set of Ties, Presets and Sequences to your Matrix (or Emulate one) Restore from the DEMO.MTX file which was installed with the Control Program. Use NEW.INI to clear all settings in a unit.

For Help on specific screens and buttons, click the appropriate item below:

Buttons & Controls of the Matrix Main Screen (graphically)
Buttons & Controls of the All other Screens

Note that pressing F1 from within the program will provide context-sensitive Help.

Figure 5-4. Example of the Help Menu

Matrix 100 Switcher
User's Manual

Appendix A

RS-232 Programmer's Guide

Control Ports

Host/Matrix Data Format

Command Structure

Communications Protocol

Using Commands

Control Ports

The picture below shows the connectors for two Control Ports.

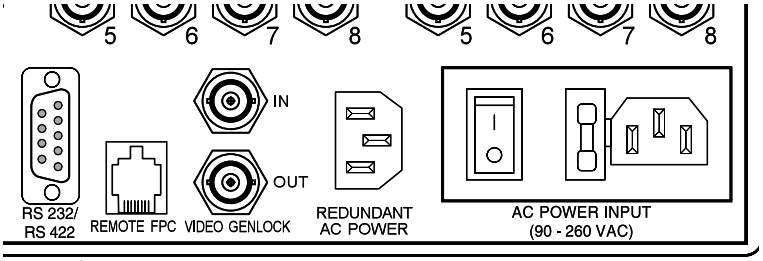


Figure A-1. Matrix 100 Port Locations on the Rear Panel

QS-FPC Control Ports

The Front Panel Controller (QS-FPC) can be used two ways: It can be mounted directly to the Matrix 100, in which case it is connected to an RJ45, 8-pin connector on the Main Controller board. The QS-FPC can also be dismounted from the front of the unit and used remotely at a distance of up to 100 feet. For remote operation, the QS-FPC is connected to the "Remote FPC" port, located on the rear panel. (See figure.) The pin configuration for the Remote QS-FPC port is shown below.

RJ45 8-pin Connections (Remote QS-FPC)

Pin	Signal	Pin	Signal
1	Gnd	5	n/c
2	Gnd	6	Tx
3	Rec	7	+5
4	n/c	8	+5

9-Pin Communication Connector

The RS-232/422 connector is a 9-pin D female with the following pin designations:

Pin	RS-232	Description	RS-422	Description
1	n/c	No Connection	TxD(-)	Transmit Data (-)
2	Tx	Transmit Data	TxD(+)	Transmit Data (+)
3	Rx	Receive Data	Rx(+)	Receive Data (+)
4	n/c	No Connection	Rx(-)	Receive Data (-)
5	Gnd	Signal Ground	Gnd	Ground
6	n/c	No Connection	n/c	No Connection
7	n/c	No Connection	n/c	No Connection
8	n/c	No Connection	n/c	No Connection
9	n/c	No Connection	n/c	No Connection

The remaining sections of this appendix cover the details of programming the Matrix 100, from a Host system, connected to the RS-232 port. Before getting into the commands, the next few pages provide some preliminary information.

Host/Matrix Data Format

Data exchange between the Matrix 100 RS-232 Controller and external control host is based on a proprietary format and protocol. The communications is byte-oriented. Any bytes fall into one of three categories:

Communication control	00 thru 1F hex
Matrix 100 command codes	20 thru 7F hex
Specific data	80 thru FF hex

Bits 0 thru 6 may be binary encoded, or they may represent numbers 00 thru 7F hex (decimal 0 thru 127).

Binary/hex/decimal Conversion Table

The table below shows how to convert data bytes from one numbering system to another. In Matrix 100 communications, all data bytes are identified by having bit 7 = 1, therefore it is not included in the computations.

Bit #s in byte: 7			6	5	4	3	2	1	0
Decimal value n/a			64	32	16	8	4	2	1
Dec.	Hex	Add the decimal values above for equivalents.							
0	80/00h	n/a	0	0	0	0	0	0	0
1	81/01h	n/a	0	0	0	0	0	0	1
2	82/02h	n/a	0	0	0	0	0	1	0
3	83/03h	n/a	0	0	0	0	0	1	1
4	84/04h	n/a	0	0	0	0	1	0	0
5	85/05h	n/a	0	0	0	0	1	0	1
6	86/06h	n/a	0	0	0	0	1	1	0
7	87/07h	n/a	0	0	0	0	1	1	1
8	88/08h	n/a	0	0	0	1	0	0	0
9	89/09h	n/a	0	0	0	1	0	0	1
10	8A/0Ah	n/a	0	0	0	1	0	1	0
11	8B/0Bh	n/a	0	0	0	1	0	1	1
12	8C/0Ch	n/a	0	0	0	1	1	0	0
13	8D/0Dh	n/a	0	0	0	1	1	0	1
14	8E/0Eh	n/a	0	0	0	1	1	1	0
15	8F/0Fh	n/a	0	0	0	1	1	1	1
16	90/10h	n/a	0	0	1	0	0	0	0
etc.									
32	A0/20h	n/a	0	1	0	0	0	0	0
etc.									
64	C0/40h	n/a	1	0	0	0	0	0	0
etc.									
99	E3/63h	n/a	1	1	0	0	0	1	1
100	E4/64h	n/a	1	1	0	0	1	0	0
etc.									
127	FF/7F	n/a	1	1	1	1	1	1	1

Command Structure

All commands follow the same pattern:

1. Command Specifier
2. Data (if any)
3. End of Transmission Mark

Command Specifier

The command specifier consists of one byte for short commands or two bytes for long commands. The first byte is the Command Code (CMD) in the range 20 hex thru 7F hex. The second byte of long commands is called the Subcommand (SCMD) and is treated as data (ranging from 80 hex to FF hex). A list of supported commands and detailed explanation are given later in this section.

Data

If present, data quantify the commands. Their format is command-specific. Data is the useful part of the information exchange - i.e., the reason for sending and receiving commands. Data is in hexadecimal values, and bit 7 is always a "1", that is, the data bytes include 80h, plus 7 bits of information.

End of Transmission

This is always (80h 80h 04h).

Host-Initiated Communications Protocol

Most of the information transfer activity is initiated by a Host system, through a control port. For example, the Host can send Commands to the Matrix to request data from, or send data to, the Matrix 100. After receiving a command, the Matrix 100 executes it and sends back a Response to the Host. The Response includes an error code, together with any requested data.

The Response includes the original Command code. Its format is as follows:

1. Command code – CMD byte (plus SCMD for some commands)
2. Error code – Erc (see lists)
3. Data (if any) – the number of bytes required for the data
4. 80h, 80h, followed by an "End Of Transmission" mark EOT

Error Codes (Erc)

The error code is usually bit-encoded and follows the data format (bit-7 always "1", to indicate a data byte). An error code of 80 (hex) indicates "no error." Other error codes specify the reason for not properly executing a command. The first error condition encountered will determine the error code. The following list has Erc codes that could occur in response to any command, and others that are associated with specific commands. (See command for description.)

Erc -description	Erc - description	Erc - description
80h - no error (normal)	81h - checksum error	82h - illegal command
90h - no I/O boards	91h - system mis-match	92h - security code error

The following error codes are related to specific commands.

Erc - see command	Erc - see command	Erc - see command
C0 - CMD7	C1 - CMD8	C2 - CMD11
C3 - CMD10	D3 - CMD1	

Matrix-Initiated Communications Protocol

Sometimes, under abnormal conditions, the Matrix 100 may detect a situation that must be reported to the Host. For example: Auxiliary power supply has been activated, memory error, backup battery must be replaced etc. These Matrix Reports are listed and explained later. They have the same general command format as the Host-initiated commands, but no response is expected from the host.

Timing

When Commands are sent to the Matrix 100 switcher, the response is delayed due to normal processing time. The response time has two components: RS-232 or RS-422 bus delay and Matrix 100 processing time. Matrix 100 processing time is variable, depending on the length of the command and the matrix size. Response time is usually less than 100 msec.

Command List (Host-to-Matrix)

Command	Hex	Page	Description
CMD0	30	A-5	request status (requires SCMD)
CMD1	31	A-6	request System ID information (requires SCMD)
CMD2	32	A-7	turn power ON
CMD3	33	A-7	turn power OFF
CMD4	34	A-7	request software version
CMD5	35	A-9	set (tie) single connection
CMD7	37	A-9	set (tie) all connections
CMD8	38	A-10	request status and presets
CMD9	39	A-10	mute all planes
CMD10	3A	A-10	save current as preset #
CMD11	3B	A-10	load preset #
CMD12	3C	A-11	mute selected outputs
CMD13	3D	A-11	request Mute map
CMD25	49	A-12	set RGB delay (after sync, for clean switching)
CMD26	4A	A-12	request RGB delay setting

SCMD = Subcommand, a second byte that further defines the Command.

Reports (Matrix-to-Host)

Command	Hex	Page	Description
RPRT0	70	A-13	report status to host
RPRT1	71	A-13	report controlling port

Communication Control

Command	Hex	Description
CR	0D	carriage return
EOT	04	end of transmission
STX	02	start of text
ETX	03	end of text
X-On	11	resume transmission
X-Off	13	interrupt transmission

Using Commands

The remainder of this appendix explains the operation of each command, including data byte breakdown, responses and possible error codes.

CMD0 (30h) - Send Status

The Host asks the Matrix for its status settings.

Format: CMD0, SCMD, 80h, 80h, 04h
Where: SCMD = 080h = send status bytes
81h-8Fh = reserved

Response: CMDØ, SCMD, Erc, Status1, Status2, Status3, 80h, 80h, 04h

Format: 30h, 80h, Erc, StsB1, StsB2, StsB3, 80h, 80h, 04h
Status Bytes (StsB1-3) are described below.

Status Byte 1:	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Bit usage:	1	Prg	Seq	Slv	Ver	Gnlk	Batt	Pwr

Where: StsB1, Bit-0 – Power On/Off status - 0 = powered on; 1 = powered off
StsB1, Bit-1 – Backup battery status - 0 = battery okay; 1 = battery low
StsB1, Bit-2 – Genlock Signal - 0 = detected; 1 = not detected
StsB1, Bit-3 – Vertical interval switching - 0 = disabled; 1 = enabled
StsB1, Bit-4 – Slave status - 0 = stand alone unit or master controller
1 = slave in a compound matrix
StsB1, Bit-5 – Sequence running - 0 = not running; 1 = running
StsB1, Bit-6 – Program status - 0 = no program event pending;
1 = program event pending (timer is set)

Status Byte 2:	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Bit usage:	1	0	0	0	0	H-Sec	0	Ps

Where: StsB2, Bit 0 – Power Supply in use - 0 = Backup Power; 1 = Main Power
StsB2, Bit 2 – Hardware Security status - 0 = locked; 1 = unlocked
(available to user, when unlocked)
StsB2, Bits 1 and 3-6 are reserved (should be zero)

Status Byte 3:	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Bit usage:	1	0	0	0	0	0	0	S-Sec

Where: StsB3, Bit 0 – Software Security status - 0 = locked; 1 = unlocked
(available to user, when unlocked)
StsB3 Bit-1 thru 6 are reserved (should be zero)

CMD1 (31h) - Report ID

The Host asks for the configuration of the Matrix. This includes such information as, what type of switching modules are installed in which planes, etc.

Format: CMD1, SCMD, 80h, 80h, 04h

SCMD	80h	Reserved
	81h	Reserved
	82h	Report technology (See example)
	83h	Reserved

Example:
SCMD = 82hReport Technology (See example at bottom of page.)

Response:
CMD1, 82h, Erc, *{(BdAd, #Inp, #Out, Tech, CR), ...} 80h, 80h, 04h

Possible Ercs:
D3 - No I/O boards detected.

The string of data bytes in parentheses is shown for one switcher, or plane; there will be an additional string for each additional plane in the Matrix 100. They will be transmitted in the ascending order of their board addresses (plane #1 first).

Where: BdAd = board (or plane) address (plane #1 = 80h, plane #2 = 81h, etc.)
#Inp = number of inputs on this plane
#Out = number of outputs on this plane
Tech = See table.

The Tech byte encodes the basic design characteristics for which the board in that position was designed.

Tech	Designed For	Features
80h	Hi-Resolution RGB (HRAM)	250 MHz DC-coupled, no clamping
81h	Sync	TTL level
82h	Low Resolution Video	30 MHz (Composite video or S-Video)
83h	Medium-Res RGB (MRAM)	175 MHz
84h	Audio	Balanced
FFh	Error	Mixed technologies (as in composed matrices)

An example response to a Report Technology command for a Matrix with 8x8 RGBS, 4x4 Composite Video and 8x8 Audio could be:

31, 82, 80, (CMD1, SCMD, Erc)

80, 88, 88, 80, 0D, 81, 88, 88, 80, 0D, 82, 88, 88, 80, 0D, (Red, Green, Blue)

83, 88, 88, 81, 0D, 84, 84, 84, 82, 0D, 85, 88, 88, 84, 0D, (Sync, C-video, Audio)

80, 80, 04 (Checksum and End of Transmission)

CMD2 (32h) - Turn Power On

The Host tells the Matrix to turn power on.

Format: CMD2, 80h, 80h, 04h
Example: 32h, 80h, 80h, 04h

Response: CMD2, Erc, 80h, 80h, 04h

CMD3 (33h) - Turn Power Off

The Host tells the Matrix to turn power off. The action is independent of other active control ports, e.g., Front Panel Controller.

Format: CMD3, 80h, 80h, 04h
Example: 33h, 80h, 80h, 04h

Response: CMD3, Erc, 80h, 80h, 04h

CMD4 (34h) - Send Software Version

The Host asks the Matrix to send the current software version. The format is "x.y".

Format: CMD4, 80h, 80h, 04h
Example: 34h, 80h, 80h, 04h

Response: CMD4, Erc, SfVer, 80h, 80h, 04h

Example: Assuming software version is 1.3 (x=1, y=3)

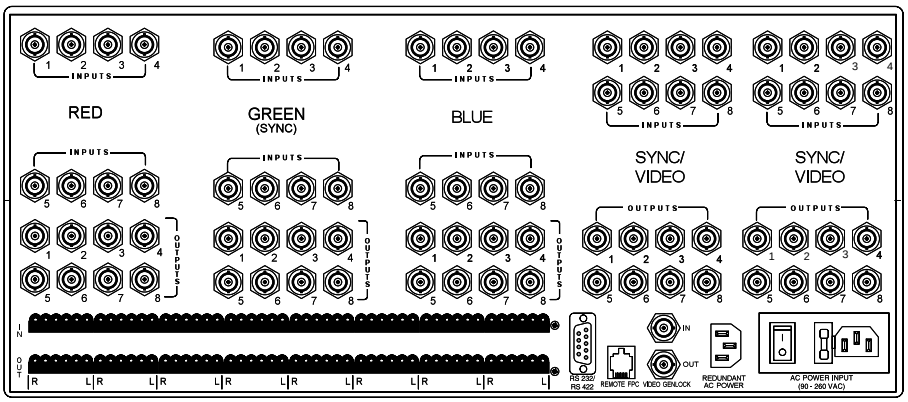
To determine the SfVer from x.y:

1. Calculate 10x + y (decimal) (10x1 + 3 = 13d)
2. Convert to hex (13d = Dh)
3. Force bit 7 to become 8Dh

The response is 34h, 80h, 8Dh, 80h, 80h, 04h

Set (Tie) Connection Commands

The Set Connection Commands that follow are the programming equivalent of the **Tie Menus** used from the QS-FPC.



Planes and Plane Maps

When looking at the rear panel of the Matrix 100, the planes are counted from left-to-right, top-to-bottom. Presently, six planes (switching modules) are supported with hardware. Planes 1, 2, and 3 are reserved for Red, Green, and Blue modules. Planes 4 and 5 can have either sync or video switching modules, depending on how the Matrix 100 was configured at the factory. A Matrix, built with both a sync and composite video switcher, will have the sync module in plane 4 and the composite video module in plane 5. Plane 6 is reserved for stereo audio.

The Matrix 100 can access the planes independently, or in combinations, or groups. Commands can access the planes, by using Plane Map bytes, called PlnMap0 and PlnMap1. (PlnMap1 is not used at this time.)

Examples below show the correlation between the planes and the bit numbers.

PlnMap0 to access the RGBS Switcher (planes 1, 2, 3 & 4)

Plane #	n/a	7	6	5	4	3	2	1
Plane Use	n/a	Audio #2	Audio #1	Sync/ Video	Sync/ Video	Blue MRAM	Green MRAM	Red MRAM
PlnMap Bit #	7	6	5	4	3	2	1	0
8F hex	1	0	0	0	1	1	1	1

PlnMap0 to access the Composite Video Switcher (plane 5)

Plane #	n/a	7	6	5	4	3	2	1
Plane Use	n/a	Audio #2	Audio #1	Sync/ Video	Sync/ Video	Blue MRAM	Green MRAM	Red MRAM
PlnMap Bit #	7	6	5	4	3	2	1	0
90 hex	1	0	0	1	0	0	0	0

PlnMap0 to access the Audio Switcher (plane 6)

Plane #	n/a	7	6	5	4	3	2	1
Plane Use	n/a	Audio #2	Audio #1	Sync/ Video	Sync/ Video	Blue MRAM	Green MRAM	Red MRAM
PlnMap Bit #	7	6	5	4	3	2	1	0
A0 hex	1	0	1	0	0	0	0	0

The plane number refers to the physical address of the I/O module.

CMD5 (35h) - Set (Tie) Connection

The Host tells the Matrix to connect the specified output (Out#) to the specified input (Inp#) in those planes specified by PlnMap0. (Plane maps are explained earlier in this section.)

Format: CMD5, PlnMap1, PlnMap0, Out#, Inp#, 80h, 80h, 04h
Example: 35h, 80h, 87h, 83h 85h, 80h, 80h, 04h
This example will connect output #3 to input #5 in RGB planes.
PlnMap1 is not used at this time, therefore it will be 80h.
PlnMap0 = 87h (bits 0, 1, 2 = 1, 1, 1 for the Red, Green and Blue planes)
See Plane Map on previous page.
Out# = 83h = Output #3
Inp# = 85h = Input #5

Response: CMD5, Erc, 80h, 80h, 04h

CMD7 (37h) - Set (Tie) All Connections

The Host tells the Matrix to set connections for any (or all) planes in Matrix. The planes must be specified by board address (BdAd), in sequential order. A preset number is assigned for saving this configuration. The configuration may be loaded later by selecting the preset number.

Format: CMD7, Preset, {(BdAd, Inp1, Inp2, .. Inpn, CR), ..}, 80h, 80h, 04h
Example: 37h, 82h, **80h**, 83h, 83h, 85h, 80h, 80h, 80h, 81h, 81h, 0Dh, **81h**... 80h, 80h, 04h

Where:

A) **Preset** is the number assigned to this configuration (example is preset #2).
Preset numbers can be 1 - 8 (81h - 94h). If the information is to be used as the current Matrix configuration, **without** saving it as a preset, the number for this will be zero (80h).

B) (BdAd, Inp1, Inp2, ... Inpn, CR) is a string of bytes for each plane record, with the following components:

a. BdAd is the board address for the plane (example is 80h = red plane).

b. Inp1 is the input # to connect to output #1. (example ties input #3)
Inp2 is the input # to connect to output #2. (example ties input #3)

c. Inpn is the input# to connect to the last output. (example ties input #1)

d. CR - carriage return (0Dh) terminates the data string for this plane.

C) Another plane record (data string) will follow for the next plane to be configured - and another, etc. for each plane to be configured.

1. The plane record has a length determined by the number of outputs (n).
2. Only existing planes are valid.
3. Any, or all, valid planes may be specified in the same command.
4. Planes must be specified in ascending BdAd address order.
(Plane 1 first; plane n last.)

Response: CMD7, Erc, 80h, 80h, 04h
Possible Ercs: C0 = Out of memory space

CMD8 (38h) - Download Status and Presets

The Host asks the Matrix 100 to send the contents of the specified preset. Same variables are used as in CMD7. Stored presets are numbered 1 thru 8.

The current Matrix setup can be accessed as preset # 0.

Format: CMD8, Preset, 80h, 80h, EOT

Response: CMD8, Erc, {(BdAd, Inp1, Inp2, ...Inpn, CR), ...}, 80h, 80h, 04h
Possible Ercs: C1 = Preset file not found

Where: Preset can be 80h (current configuration) or 81h (1) thru 88h (8). As described in CMD7, there is a data string for each plane, starting with its board address (BdAd) and ending with 0Dh (carriage return).

CMD9 (39h) - Mute All Planes

The Host instructs the Matrix to mute (deactivate) all outputs in specified planes.

Format: CMD9, PlnMap1, PlnMap0, 80h, 80h, 04h
Where: PlnMap1 and PlnMap0 follow the format described for CMD1. Bits are "0" for normal operation and "1" to mute the plane.

Example: If PlnMap1, PlnMap0 = 080h, 083h. Red and Green channels are muted. All RGB displays connected to Matrix 100 outputs will show only the blue component of the signal.

At this time, only PlnMap0 is supported by hardware. PlnMap1 = 80h. Bits for nonexisting planes are forced to 0.

CMD10 (3Ah) - Save Current as Preset

The Host tells the unit to save its current connections as a preset. (The preset can be called later using CMD11.)

Format: CMD10, Preset, 80h, 80h, 04h
Where: Preset can be 81h (1) thru 88h (8).

Response: CMD10, Erc, 80h, 80h, 04h
Possible Ercs: C3 = Out of memory space

CMD11 (3Bh) - Load Preset

The Host tells the Matrix to load (activate) a stored preset configuration. The connections previously stored under the specified preset number become active. The current connections are lost, unless they have also been saved as a preset.

Format: CMD11, Preset, 80h, 80h, 04h

Response: CMD11, Erc, 80h, 80h, 04h
Possible Ercs: C2 = Preset file not found

CMD12 (3Ch) - Mute Selected Outputs

The Host tells the Matrix to mute specific planes, within selected outputs.

Format: CMD12, Mute1, Mute2, ... MuteN, 80h, 80h, 04h

Where: MuteN specifies planes to be muted for the output corresponding to the mute byte number. This uses the same format as PlnMap shown below.

PlnMap0 to access the RGBS Switcher (planes 1, 2, 3 & 4)

Plane #	n/a	7	6	5	4	3	2	1
Plane Use	n/a	Audio #2	Audio #1	Sync/ Video	Sync/ Video	Blue MRAM	Green MRAM	Red MRAM
PlnMap Bit #	7	6	5	4	3	2	1	0
MuteN	1	x	x	x	x	x	x	x

MRAM = Medium Resolution Analog Module.

Example: Assume an 8 x 8 switch, with RGBS, Composite video and Audio.
3Ch, 87h, A0h, 90h, 97h, 80h, 80h, 80h, 80h, 80h, 80h, 04h

The following outputs are muted:

87h	Output 1:	R, G, B (leave sync on)
A0h	Output 2:	Audio Stereo (Left + Right)
90h	Output 3:	Composite video
97h	Output 4:	R, G, B and Composite video
80h	outputs 5 - 8	Outputs not muted

Response: CMD12, Erc, 80h, 80h, 04h

CMD13 (3Dh) - Request Mute Map

The Host asks the Matrix to send which outputs are muted. The response sends back the same data, in the same format as CMD12.

Format: CMD13, 80h, 80h, 04h
Example: 3Dh, 80h, 80h, 04h

Response: CMD13, Erc, Mute1, Mute2, ... MuteN, 80h, 80h, 04h

Where: MuteX specifies planes to be muted for the output corresponding to the mute byte number. This uses the same format as PlnMap shown above.

CMD25 (49h) - Set RGB Delay

The Matrix is instructed to set values for RGB delay. When switching occurs, the R, G and B switching will take place after the specified time delay. The sync switching takes place immediately, but the RGB outputs are muted during this delay period. This allows the projector to get in sync before the picture arrives, providing seamless switching.

Format: CMD25, Dly1, Dly2, ... DlyN, 80h, 80h, 04h
Where: Bits 0-6 of each "Dly" byte represent the RGB-to-sync delay for that output (expressed in increments of 0.1 sec). "N" represents the number of last available output, as determined by command CMD1. (Dly1 = output #1; Dly2 = output #2, etc.)

Delays must be specified for each output. For zero time delay, DLY = 80h. The time delay depends on the requirements of the output device (projector, etc.).

Example: 49h, 84h, 90h, etc. says the RGB for output #1 (84h) will be delayed by 0.4 seconds, and output #2 (90h) will be delayed by 1.6 seconds, etc.

Response: CMD25, Erc, 80h, 80h, 04h

CMD26 (4Ah) - Request RGB Delay Information

The Host asks the Matrix to send delay switching information for each of the RGB planes.

Format: CMD26, 80h, 80h, 04h
Example: 4Ah, 80h, 80h, 04h

Response: CMD26, Erc, Dly1, Dly2, ... DlyN, 80h, 80h, 04h
Where: The "Dly" characters have the same significance as in previous command (CMD25). "N" represents the number of last available output, as determined by command CMD1. (Dly1 = output #1; Dly2 = output #2, etc.)

Reports (Matrix-to-Host)

Report0 (70h) - Status

This report is broadcast when a change in internal status is detected.

Format: RPRT0, StsB1, StsB2, StsB3, 80h, 80h, 04h

Status Byte 1:	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Bit usage:	1	Prg	Seq	Slv	Ver	Gnlk	Batt	Pwr

Where: StsB1, Bit-0 Power On/Off status - 0 = powered on; 1 = powered off
StsB1, Bit-1 Backup battery status - 0 = battery okay; 1 = battery low
StsB1, Bit-2 Genlock Signal - 0 = detected; 1 = not detected
StsB1, Bit-3 Vertical interval switching - 0 = disabled; 1 = enabled
StsB1, Bit-4 Slave status - 0 = stand alone unit or master controller
1 = slave in a compound matrix
StsB1, Bit-5 Sequence running - 0 = not running; 1 = running
StsB1, Bit-6 Program status - 0 = no program event pending;
1 = program event pending (timer is set)

Status Byte 2:	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Bit usage:	1	0	0	0	0	H-Sec	0	Ps

Where: StsB2, Bit 0 - Power Supply in use - 0 = Backup Power; 1 = Main Power
StsB2, Bit 2 - Hardware Security status - 0 = locked; 1 = unlocked
(available to user, when unlocked)
StsB2, Bits 1 and 3 thru Bit 6 are reserved (should be zero)

Status Byte 3:	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Bit usage:	1	0	0	0	0	0	0	S-Sec

Where: StsB3 Bit 0 - Software Security status - 0 = locked; 1 = unlocked
(available to user, when unlocked)
StsB3 Bit-1 thru 6 are reserved (should be zero)

Report1 (71h) - New Controlling Port

This report is broadcast when a change in the connections (current or presets) or the operating mode is requested (and implemented) by a new port. Commands CMD5, 7, 9, 11, 12, and 25 will cause this report to be sent.

Format: RPT1, Port#, 80h, 80h, 04h
Where: Port# as follows ...
80h host controller (RS-232/RS-422)
81h n/a
82h standard front panel controller port
83h secondary front panel controller port

B

Appendix B

Part Numbers & Reference

Related Part Numbers

Switcher Module Part Numbers

BNC Cables

Matrix 100 Numbering System

Limited Warranty

Related Part Numbers

Extron Part	Part #
Blank Front Panel	60-147-01
Front Panel Controller (QS-FPC)	60-188-01
Audio Connectors (Phoenix)	10-163-01
SVHS-to-BNC Adapter	26-353-01
GLI 250	60-123-01
- (Ground Loop Isolator, 250 MHz RGBHV)	
PA 250	60-124-01
- (Peaking Amplifier, 200 MHz RGBS)	
Matrix 100 User's Manual	68-199-01 - *(this manual)*
SC 110 Sync Combiner (115v)	*60-153-01 (230v = 60-153-02*
SC 210 Sync Processor (115v)	*60-154-01 (230v = 60-154-02)*

Option Kit Part Numbers

Kits can be ordered from Extron for adding modules to an existing Matrix 100. The following list gives part numbers for available kits.

Matrix 100 Option Kit	Part #
Redundant Power Supply	70-020-01
8 x 8 Stereo Audio Module	70-039-01
4 x 4 MRAM (for RGB)	70-041-01
8 x 4 MRAM (for RGB)	70-041-02
8 x 8 MRAM (for RGB)	70-041-03
4 x 4 Sync Module	70-024-01
8 x 4 Sync Module	70-024-02
8 x 8 Sync Module	70-024-03
4 x 4 Composite Video	70-025-01
8 x 4 Composite Video	70-025-02
8 x 8 Composite Video	70-025-03

These kits include all the necessary parts, as well as instructions for a qualified person to add options to a Matrix 100. Chapter 2 of this manual also has some procedures for adding options.

BNC-4 Cables (High Resolution BNC Cables)

Extron BNC-4 cables are high resolution (HR) BNC cables, color coded with solid colors and wrapped in a single jacket. The total cable diameter is 0.398". Extron recommends that when using signals with a scanning frequency of 15-125 kHz and running distances of 100 feet or more, high resolution BNC cables should be used to achieve maximum performance. The following cables are stock lengths:

Cable -Length	Part #
BNC-4-3' HR	26-210-01
BNC-4-6' HR	26-210-02
BNC-4-12' HR	26-210-03
BNC-4-25' HR	26-210-04
BNC-4-50' HR	26-210-05
BNC-4-75' HR	26-210-06
BNC-4-100' HR	26-210-07
BNC-4-150' HR	26-210-08
BNC-4-200' HR	26-210-09
BNC-4-300' HR	26-210-53
BNC-4-500' HR	Bulk Length
BNC-4-1000' HR	Bulk Length

Bulk cable in lengths up to 5000' rolls is available with or without connectors.

BNC Cable Specifications

Conductors	Silver Plated Alloy
Insulation	Foam Polypropylene
Nominal Outer Dimension	0.398"
DC Resistance	41.5 Ohms/1000 ft.
Impedance	75.5 Ohms, Nominal
Time Delay	1.28 Nanoseconds/ft.
Capacitance	17 pF/ft.

BNC-5 HR Cables

High resolution 5 conductor BNC cables include cables for Red, Green, Blue, Horizontal and Vertical Sync. These cables are required when using the Matrix 100 with separate horizontal and vertical sync inputs and outputs. The specifications are the same for the BNC-5 HR and BNC-4 HR cables.

Matrix 100 Part Numbering System

The Matrix 100 can be factory-configured with many combinations of switcher modules. The diagram below illustrates how the part numbers are derived.

All Matrix 100 part numbers begin with 60-182, the remaining digits are determined by other options. Use this diagram when ordering a new Matrix 100.

1. S-Video uses two Composite Video modules. The hardware is the same, the difference is how they are used.
2. If a Matrix has S-Video, it cannot have a sync module.

Example 1:
A Matrix 100 with
8x8 RGB,
8x8 Hor. & Vert. sync,
Stereo Audio,
QS-FPC and a
Redundant Power Supply
will have the part number:
60-182DXAZB

Example 2:
A Matrix 100 with
8x4 RGsB,
8x4 S-Video,
Stereo Audio,
and a QS-FPC
will have the part number:
60-182CVAZH

Example 3:
A Matrix 100 with
4x4 RGBS,
8x4 Composite Video,
and a Blank Front Panel
will have the part number:
60-182BKBYA

This number will be on a label on the shipping box.

Matrix-100
Part Number 60-182
(Includes Base Module Enclosure)

RGB Video
No RGB Video Option - A
4 x 4 RGB Video - B
8 x 4 RGB Video - C
8 x 8 RGB Video - D

Horiz & Vert Sync Options
4 x 4 H & V Sync (2 Sync Modules) - Z
8 x 4 H & V Sync (2 Sync Modules) - Y
8 x 8 H & V Sync (2 Sync Modules) - X

S-Video Options
4 x 4 S-Video (2 Comp Video modules) - W
8 x 4 S-Video (2 Comp Video modules) - V
8 x 8 S-Video (2 Comp Video modules) - U

Comp Sync/Comp Video Options
4 x 4 Comp Sync only (1 sync module) - T
8 x 4 Comp Sync only (1 sync module) - S
8 x 8 Comp Sync only (1 sync module) - R
4 x 4 Comp Video only (1 C-Video module) - Q
8 x 4 Comp Video only (1 C-Video module) - P
8 x 8 Comp Video only (1 C-Video module) - O

Sync/Video Combinations

Video \ Sync	4x4	8x4	8x8
4x4	N	M	L
8x4	K	J	I
8x8	H	G	F

F-N

No Comp Sync or Comp Video - E

Audio Module (8 x 8)
Yes - A
No - B

Quick Front Panel Controller (Q-FPC)
Yes - Z
No - Y

Other Options
Blank Front Panel - A
Redundant Power Supply - B
Blank Front Panel & Redundant Power Supply - E
None - H